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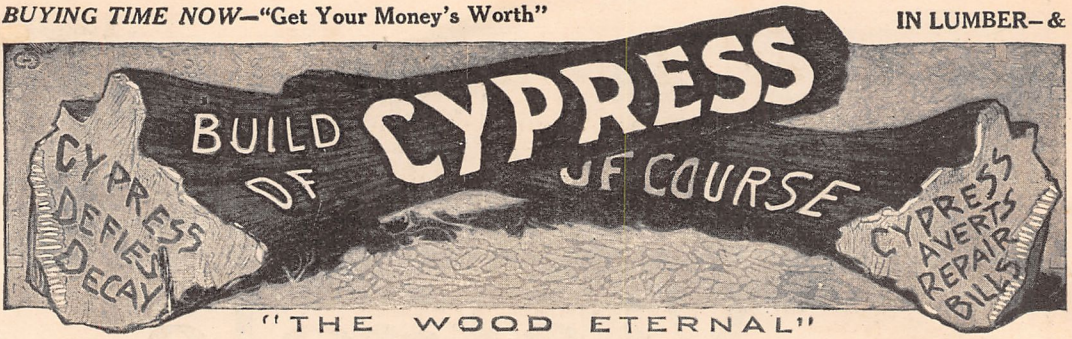

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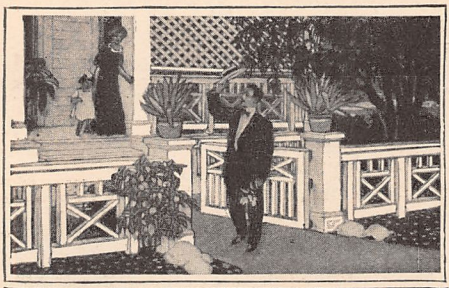

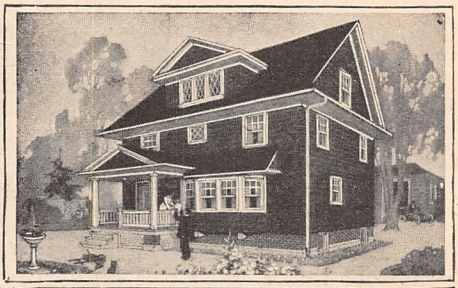

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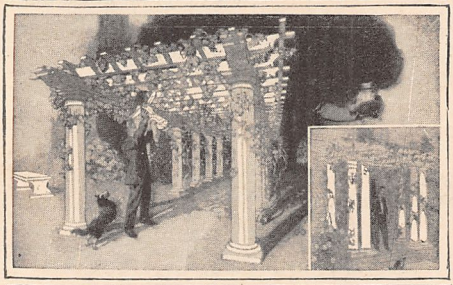

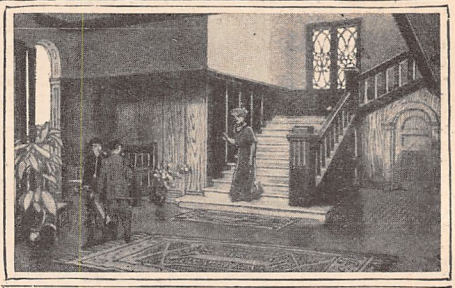

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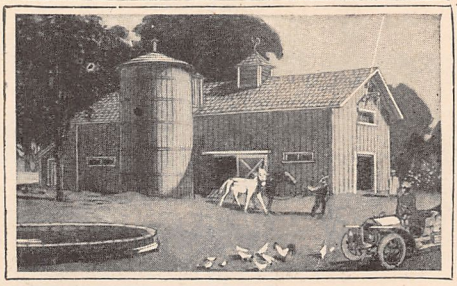

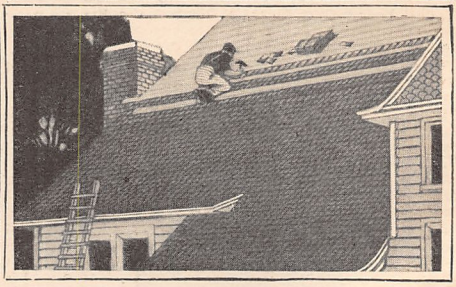

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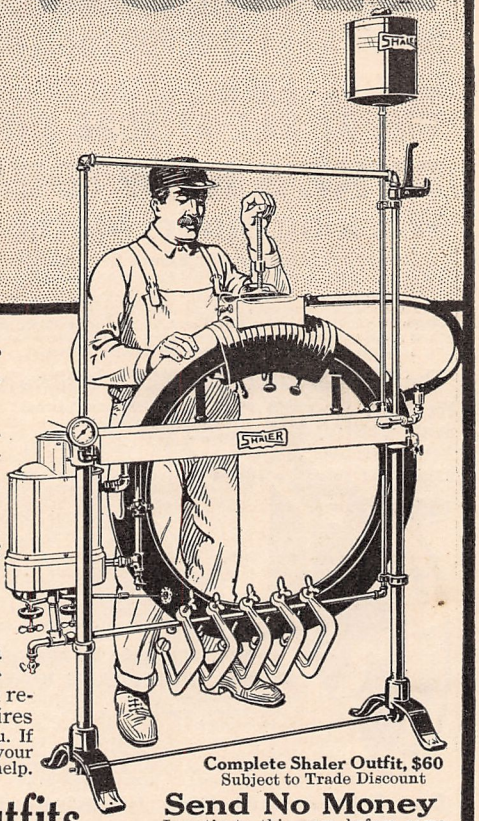

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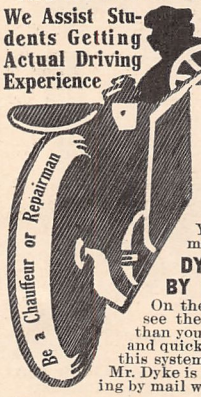

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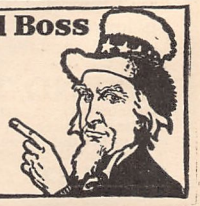

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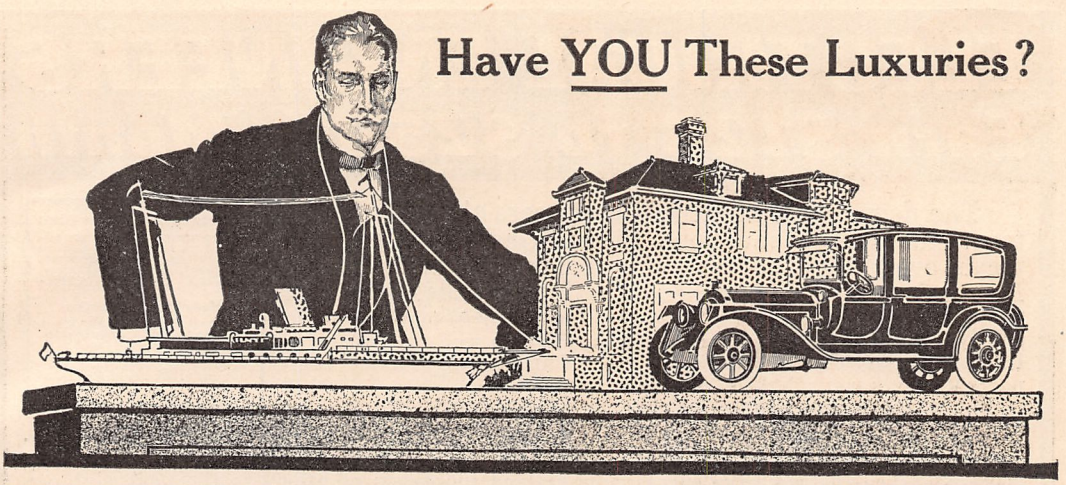

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How to handle the mind in Creative Thinking.
The secret of Building Mind Power.
How the Will is made to act.
How to test your Will.
How a Strong Will is Master of Body.
What creates Human Power.
The Six Principles of Will Training.
Definite Methods for developing Will.
The NINETY-NINE METHODS for using Will-Power in the Conduct of Life.
Seven Principles of drill in Mental, Physical, Personal Power.
FIFTY-ONE MAXIMS for Applied Power of Perception, Memory, Imagination, Self-Analysis, Control.
How to develop a strong, keen gaze.
How to concentrate the eye upon what is before you—object, person, printed page, work.
How to become aware of Nerve Action.
How to keep the body well poised.
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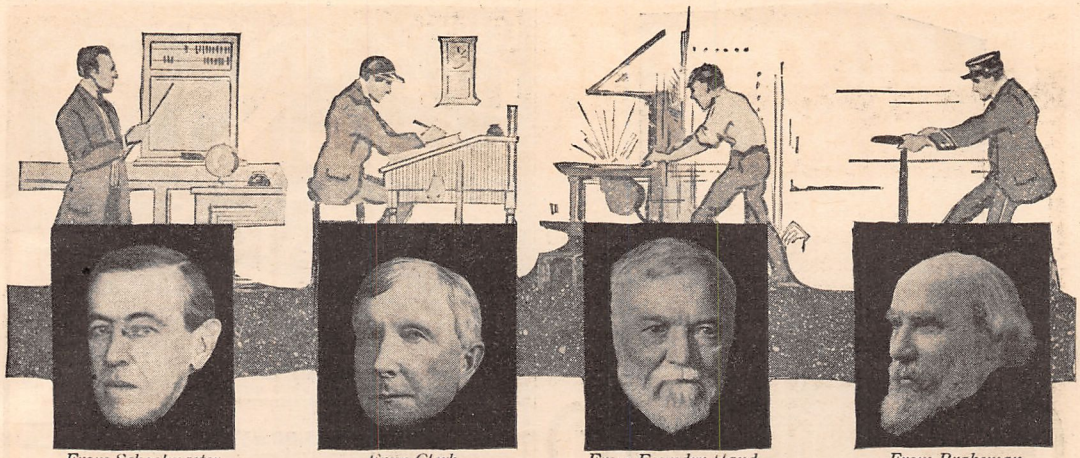

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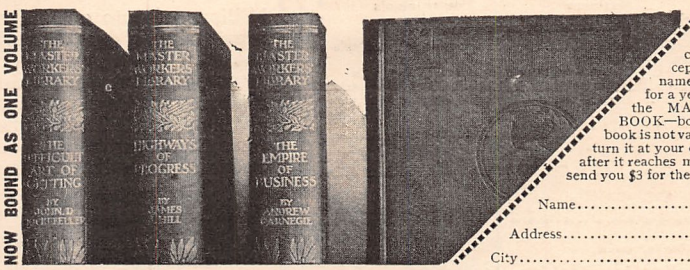

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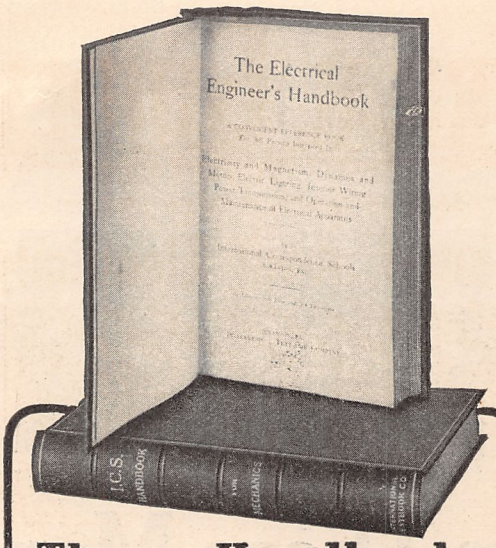

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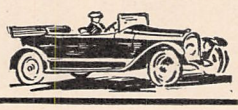

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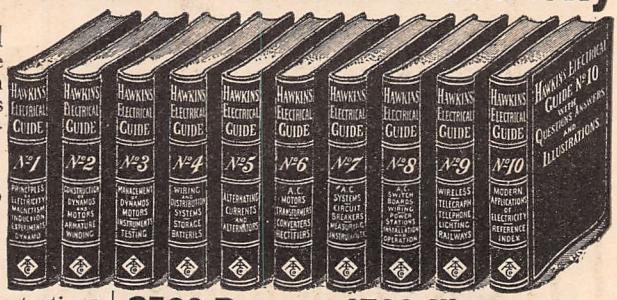

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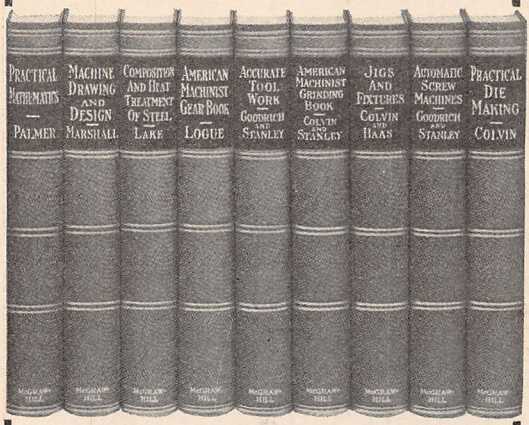

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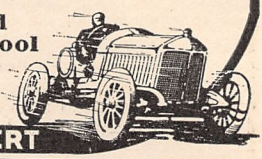

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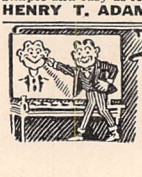

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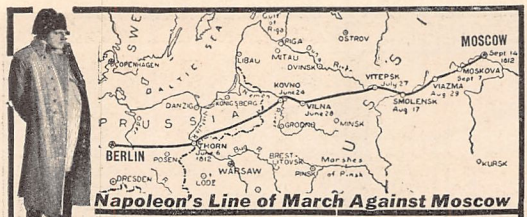

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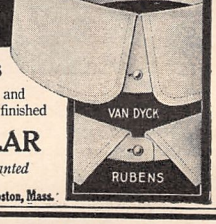

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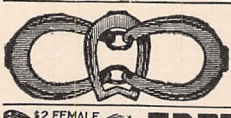

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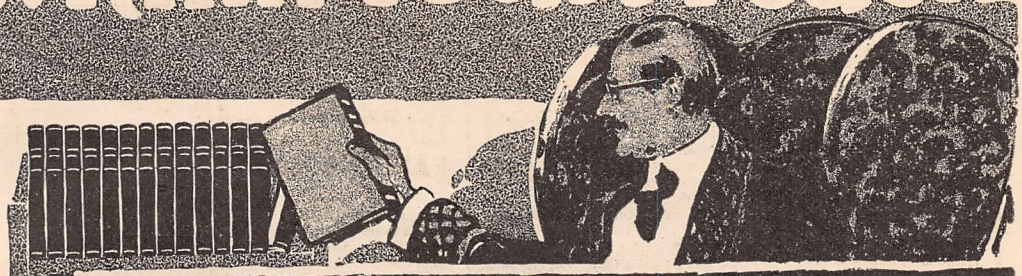

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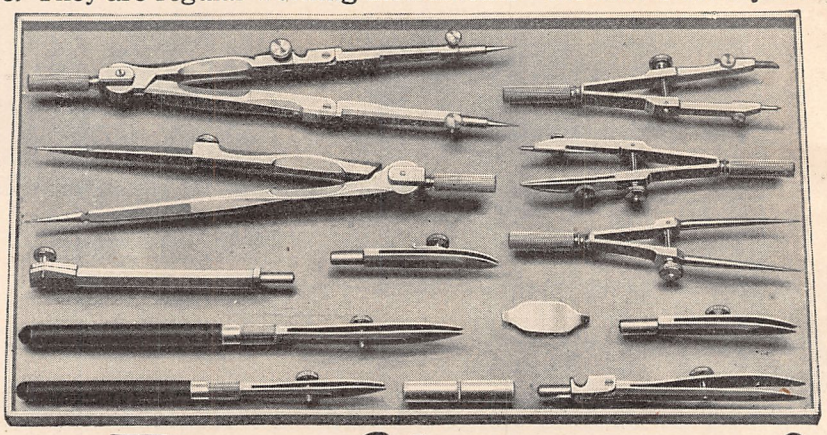

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ENDLESS Neckties—Something new; twelve ties in one; costs no more than old style; man made $70 three days; woman made $92 week; write for special agents' offer. Endless Neckties Mfg. Co., Dept. 10, Kansas City, Mo.

EVERYBODY: Indian Finger Traps: Fast seller. Sample, 10c; Gross, $2.50. William Fisher Company, Harrisburg, Pa.

TAILORING Agents Wanted—Big complete sample outfit and case, nearly 300 large cloth samples, 3 price lists and everything needed for canvassing or use in store, free to live agents. $25.00 to $50.00 a week; may make more. Write us today for free elegant outfit to begin, cloth samples, wholesale prices, special offer on a suit for yourself and full information—see our wonderful values, beautiful fabrics and styles. Established 28 years. Every garment made to measure—everything guaranteed and express prepaid. Just send a postal. American Woolen Mills Co., Dept. 514 Chicago.

AGENTS—Handle a big money-making, order-getting winner. New, useful article. Write for particulars. House, 4245 N. Lamon Ave., Chicago, Ill.

COMMODITY consumed in every home and business. Repeats continually. Canadian rights disposed of. Samples fifty cents to genuine, legitimate mail order and agents. No others considered. "Cutlers," Toronto, Canada.

233% PROFIT selling our 25c Sheet Music at 5c. Particulars Free; 3 samples, 10c. Keller, Robson & Munk, 36 W. 118th St., New York.

READ the Agents Magazine and make more money. 2 issues 10c. Agents Magazine, Chicago.

AGENTS Wanted—To handle remarkable money-makers, easy to handle, easy to sell, many repeat orders. Write quickly. Dorsa Novelty Co., 560 2nd Ave., New York.

SUITS $3.75. Pants $1.00, made to measure. For even a better offer than this, if you live in a small town, write and ask for free samples and styles. Knickerbocker Tailoring Co., Dept. 371, Chicago, Ill.

NEW Auto Power Pump Appliance, not attached to engine. Pumps tire sixty seconds. Ford tire 35 seconds. Selling like hot cakes, $3.75. Healy Company, Buffalo, N. Y.

AGENTS or Salesmen Wanted. "Drifoot" waterproofs shoes, 25c. No free samples. Mulbouney, Paxtang, Pa.

HOUSEHOLD Necessity, 200% profit, success assured. Sample 25c. Sharpoint Co., Logan, Philadelphia.

AGENTS. Make your pile this summer by selling our adjustable 250 candle power Searchlight for motorboats, yachts, etc. Can be taken on shore and used as a lantern in camps or as a table and wall lamp in tents. A boon for fishermen. Grand Rapids Novelty Co., 553 Woodlawn St., Grand Rapids, Mich.

AGENTS, Sell Buckeye Raincoats, $4.98 up. Big sellers. New proposition. Write for particulars. Dept. P, Buckeye Manufacturing Company, 1 Union Square, New York City.

THEY sell on sight! Our marvelous Nibco Auto Washer for cleaning automobiles. Also our adjustable floor and wall mops, dustless dusters, sanitary brushes and other household specialties. Complete line. Immense profits. Write now. Silver-Chamberlin Co., Dept. M, Clayton, New Jersey.

MAIL-ORDER Opportunities: 25 new Propositions. No competition! Make 95c profit on dollar order; complete outfit 10c. Mail Dealers Wholesale House, 521 Franklin Bldg., Chicago.

MARVELOUS Expanding Cuff Button spreads two inches; Presto, cuffs over elbows without unbuttoning, lower cuffs they close automatically; stay where placed upon forearm; greatest laundry and shirt saver invented; combines utility with convenience, invisible; endorsed everywhere; no competition; demanded everywhere; high grade article with merit; DeWilde, Sheboygan, Wisc., sold 750, 10 days profits $400. You can do as well. Most sensible cuff button invented; exclusive territory. Money back if not as represented; no fake goods. High grade specialty agents make big money; Fakers, Pikers and Sample Grabbers save your postage. Flexo, Sheboygan, Wisc.

BIG Profits! New Tartaric Mirror Silvering Process opens enormously profitable business. O. Barstow, 514 23rd St., Oakland, Calif.

HERE'S an unusual business chance—A rare opportunity to make money and build a big, permanent, profitable business. Sell Crystal. It's a wonder; washes clothes without rubbing or boiling, without injury to skin or fabric; a whirlwind seller and repeater. Full particulars and sample on request. Utility Mfg. Co., Chippewa Falls, Wis.

RAPID selling calculating instruments, six kinds, varying from 50 cents to $5.00. Leishman Arcascope & Supply Co., Ogden, Utah.

OUR Custom Raincoats are the fastest sellers. Biggest commissions. Best free offers. Imperial Raincoat Co., Clerk 5, Boston, Mass.

PUSH & Pull Screen Door Plates. New and different. 400% profit. Quick sales. No "outfit" to buy. Sample pair and proposition free. Hardenburgh-Signs, 101 Cedar, Missoula, Montana.

AGENTS: Brand new $1.50 article, 100% profit selling grocers, general stores, restaurants. 30,000 already sold. Great side line for salesmen. Some making $30 weekly. Eugene Manufacturing Co., Canton, Ohio.

WE want capable, live wire General Agents and Crew Managers to sell an absolutely new Household Specialty guaranteed by $200,000 Corporation. It's a big value household necessity that no woman can resist. Easy sales mean big profits. Our follow-up is unusual, and we give you exclusive territory, and advertise the business for you. Wm. J. Dick, Dept. J-21, 20 W. Lake, Chicago.

ONLY Two Sales a Day means $3.60 net profit; more sales, more dollars. You can do it. Just investigate our latest Aluminum Combination Set, the women go wild over, and let me show you how to make at least $3.60 a day. Sales Manager, 1423 Westmoreland St., Philadelphia.

MAKE and sell your own goods. Formulas by Expert Chemists. Manufacturing processes and trade secrets. Formula Catalog for stamp. Blake Mystic Company, Washington, D. C.

AGENTS—$10-$20 a day introducing our high-grade specialties. Write quick. Van Wyatt Bros., Richfield, N. C.

$10 DAILY refinishing chandeliers, brass beds, etc., by new method, producing amazing results; no capital or experience necessary; write for information. Gunmetal Co., Ave. H, Decatur, Ill.

WANTED live State Agents for patented Sanitary Sugar bowl. Quick sales, large profit, exclusive territory. No triflers. Schoenheit & Pease, E. E., Pittsburgh, Pa.

"MAKE Gas-Tonic" See Miller's Advertisement—Business Opportunities.

A MAN with sales ability and gilt-edge references can establish himself in permanent territory selling high-grade reproductions of the world's best paintings to consumers. New sales plan by which dealer introduces you to his trade and helps you sell them. Commission contract worth $50 to $150 weekly to live wire. Proposition solid as a rock, backed by ten million dollar corporation. The Cincinnati Fine Arts Company, 28 Beech St., Cincinnati, Ohio.

NEW Electric Water Purifier and Sterilizer purifies drinking water instantly from all kinds of bacteria or germs through electricity; endorsed by physicians; costs $1, sells on demonstration for $2; exclusive territories granted. Triumph Products Co., Transportation Bldg., Chicago, Ill.

AGENTS, Dealers, wonderful new invention. Patent necktie presser, removes wrinkles from neckties, makes them look like new. A time and money saver. Not bulky, fits in your grip. A live one. Retails 50c. Send 25c for sample and terms. Burdett Necktie Presser Co., 20 Park Ave., Claremont, N. H.

MEN and Women Agents: Money talks—how much are you making? If you are earning less than $200 a month, no matter what your locality, you will positively be delighted with our adjustable Burglar Alarm proposition. Many agents easily earn $15.00 daily. Brand-new invention. Sells quickly on sight to homes, offices. Patented. No competition. Instantly attached any door knob. Impossible turn knob without ringing bell. No batteries, screws, nails. Handsomely nickel-plated. Retails $1.50. Provides cheap burglar insurance. It's a big money maker. Let us prove why. If you mean business write today for liberal terms to agents. Keyless Lock Co., 693 Jackson Blvd., Chicago.

SELL the "Penkup—Makes every pen a fountain pen. Sells like wildfire. Every office buys from one to a gross. Attach to any pen, writes 500 words with one dipping. Price 10c—145% profit to agents. Send 10c for sample and full particulars. Penkup Sales Co., 502 Coleman Building, Phila., Pa.

AGENTS—Send for sample "Fretnot"—the wash day wonder. Be convinced you can do a whirlwind business. You can clear at least $20 to $100 weekly, according to spare or whole time. You don't have to talk, if she doesn't buy at sight, leave sample, she will be looking for you long before you are able to make the rounds again. Samples furnished free. Premiums for your customers. Exclusive territory granted to agents who can produce. Credit given. Don't call. P. M. Motter & Sons, 3213 Warren Ave., Chicago.

RELIABLE People Wanted to place our Orangeade Powder in stores and appoint agents. Makes the most delicious drink you ever tasted by just adding cold water and sugar. Enough for 17 glasses and particulars 10c postpaid. Chas. A. Morrissey Company, 4417 Madison St., Chicago.

SEND 25c in coin for my Wonder Stocking or Hose Heel Protectors. Friese Novelty Co., 1716 N. Campbell Ave., Chicago.

OUR Agents making $50 to $75 weekly. You can do same. Write for terms. Free sample. Chicago Germicide Co., Ogden, Jackson, Hermitage, Chicago.

AGENTS. Articles which housewife cannot resist. W. H. Walters, 212 South Clinton St., East Orange, N. J.

SIGN Letter Agents and Painters; 500% Profit Gold and Silver Sign Letters for Stores and Office Windows. Anyone can put on. Big demand. Free samples. Metallic Letter Co., 404 N. Clark St., Chicago.

AGENTS make big money and become sales managers for our goods. Fast office sellers. Fine profits. Particulars and samples free. One Dip Pen Company, Dept. 2, Baltimore Md.

AGENTS Wanted. We start you in business in your own town with $25 capital; new incandescent nitrogen lamp, giving a very brilliant white light, cuts electric light bill in half; tremendous field, exclusive territory given. Write for full particulars. Ernest Rubes Company, 220 Taaffe Place, Brooklyn, N. Y.

AGENTS—Splendid opportunity to make money selling our Egg Testers to Merchants and others. Exclusive territory. Rapid Egg Tester Co., 326 W. Madison St., Chicago.

$2.50 PER day salary paid one man or woman in each town to distribute circulars and take orders for non-alcoholic flavors in tubes. Permanent—easy work. Ziegler Co., 7P, E. Harrison St., Chicago.

FAST Selling "Kantleak" Raincoat proposition. Cooper earned $60 in 5 days. Bridge $88 in 6 days. We deliver and collect. New 1916 watches Free. Write today. Comer Mfg. Co., 200 Paige St., Dayton, Ohio.

MAKE good money selling Feeny Vacuum Cleaners and clothes-line reels. Live proposition. Write quick. Feeny Mfg. Co., D-75, Muncie, Ind.

AGENTS are coining money selling our big 10c Packages of 20 Assorted Postal Cards. "5,000 Varieties." "Big Profits." Sell everywhere at sight. Sample Packages 10c. Particulars Free. Sullivan Card Co., 1234 Van Buren St., Chicago, Ill.

AGENTS, Stop! Look at this. No better work on the market in Portraits. Work guaranteed, low prices, free sample roll, prompt shipments. F. A. Wanderley, Wheaton, Ill.

PHOTO Pillow Tops, Portraits, Frames, Sheet Pictures, Photo Plates, Pennants. Rejects credited. Prompt shipments; samples and catalogues free to agents; 30-days' credit. Jas. C. Bailey Co., Desk A5, Chicago.

ONE Thousand Dollars Reward—We will forfeit $1,000 if this is not the greatest money-making house-to-house proposition advertised in these columns. N.R.G. Little Wizard Labor Saver washes clothes in 10 minutes absolutely without rubbing. It contains no paraffin or wax and there is nothing like it on the market. Sells for 15c; enough for five family washings. We supply you with all the free samples you need. All you do is to leave the free sample with the housewife and when you call again she is waiting to become your steady and permanent customer. This is positively the most scientific and wonderful labor saver of the age, and you will make a great mistake if you do not secure territorial rights at once. A one-cent postal card brings full particulars. Farquhar-Moon Mfg. Co., Dept. C-200, 140 W. Van Buren St., Chicago, Ill.

$5.00 TO $10.00 Daily—Sell necessary article every home, office, store, restaurant, hotel, club, etc.; buys in lots 1 to 12 or more. Magic Sticky Fly String—beats old style paper poisons, sticky ribbons, swatting. Half hour test—six feet of "Magic" caught 52 flies, while 14 sheets fly paper caught but 27. Two hour test—21 inches of "Magic" caught 17, while same length 2 inch wide, double coated ribbon caught but 7. Can lasts twelve weeks. Biggest sensation of the day! Enormous profits. Write quick. Sample postpaid 20c (refunded). Rodolph, Northwestern Building, Chicago.

GOOD opportunity for "Live Ones" to sell electrical wonder. Violet Ray machine. Operates on both currents. Endorsed by physicians; wonderful seller; sells to doctors, dentists, barbers, beauty parlors, homes, etc; fine proposition for able salesmen. Eastern Electric Company, Cleveland, Ohio.

AGENTS—Make big money selling iron sheet holder. Write for particulars. Sample 35 cents. Otis Novelty Sales Co., 123 Cushing St., Providence, R. I.

MEN and Women with spare time can earn big weekly profits by our new advertising plan. No investment. No selling. No soliciting. Write today for details for this new money maker. Crown Mfg. Co., Dept. J-1, 20 W. Lake St., Chicago.

AGENTS—Men and women; make $30 to $50 weekly selling the New Improved Monitor Self-Heating Iron—the "World's Best." Over 750,000 in use. Positively the easiest, fastest selling, lowest priced, best known iron made. Binding Guarantee. Big profits for all or part time. Evans, N. Car., sold two dozen on Saturday. Mrs. Nixon, Vt., sold eight first half day. New low terms. Exclusive territory. Sample free to workers. Write today. The Monitor Sad Iron Co., 740 Wayne St., Big Prairie, Ohio.

THE Cutest Thing! Sell our wonderful Baby picture. Sells at sight with novel selling plan. Big money for you. Exclusive territory. Retails 25c. To you $1.50 doz., $15 gross or $60 thousand cash with order. Everyone agitating about the Baby. Two samples to try out 25c; none free. Miller P. M. Co., 1220 Hood Ave., Chicago.

POSTCARDS 90c per 1,000 up; Fountain pens, razors, flycatchers, books, jewelry, etc.; 10c brings samples. P. Gross Onard Co. 2147 Arthur Ave., New York.

MAKE $3,000 this year. Start in a business of your own. Represent us in your town. No experience required. Write today for great proposition to wide-awake people. Darling Company, Dept. 13, Washington, D. C.

AGENTS free sample and particulars Delbare's Naptha Washing Tablets. Wash clothes without rubbing. Guaranteed not to injure the finest fabric. No acids, lime nor caustics. Manufactured and sold by Naptha Washing Tablet Co., 718 So. Dearborn, Chicago, Ill.

MANAGER wanted in every city and county; send out agents to sell Amber polish to every home, automobile owner, cafe, etc.; repeat orders make you big money; new selling plan. Write only to N. L. Pedersen, 602 Driggs Ave., Brooklyn, N. Y.

AGENTS, $60 a week to travel by automobile and introduce our 300 candle power coal-oil lantern. Write for particulars of our auto offer. Thomas Co., 862 North St., Dayton, Ohio.

AGENTS, crew managers, aluminum salesmen—you can make $50.00 to $75.00 per week selling our 36-piece Leap-Year Aluminum Kitchen Set at $3.98. Samples free. Write for territory quick. Aluminum Ware Company, Maywood, Illinois.

AGENTS—Here's the best line of food flavors, perfumes, soaps, toilet preparations, etc., ever offered. No capital needed; complete outfits furnished free to workers. Write today for full particulars. American Products Co., 3383 Third St., Cincinnati, O.

AMAZING, startling, sensational, stupendous, new guaranteed easy insurance protection plan. Hustling agent 18 to 60 wanted in each locality to represent big sick and accident company. W. G. Critchlow, Dept. 2721, Covington, Ky.

AGENTS—Just out; $5 Machine for making any size compression or tension springs; garages, shops, mechanics buy at sight. Your profit $2.50. National Mfg. Co., 399 Huron St., Toledo, Ohio.

AGENTS—New mighty money making marvel; 8 men order 47,620 pkgs., first 16 days; Kalomite revolutionizes clothes washing ideas; $100 weekly repeat order business; abolishes rubbing, washboards, washing machines; $1,000 guarantee absolutely harmless; Kalomite works wonders; women astounded; no experience necessary; credit granted; write for overwhelming proof; Equitable Corporation, Dept. 357, 215 W. Superior St., Chicago.

AGENTS, sell and smoke "The American Pipe of Peace." Every puff a delight, cool, healthy, delicious. The Pipe of Peace, Prosperity and Plenty. Retail price 50c. Special agent's price 25c. U. Delendonck, 505 Fifth Ave., New York City.

BIG Profits. New Gold and Silver Sign Letters for store and office windows. Anyone can put on. Free samples. Flexible Letter Co., 1642 Division, Chicago, U.S.A.

AGENTS Wanted—Agents make 500 per cent profit selling "Novelty Sign Cards." Merchants buy 10 to 100 on sight. 800 varieties. Catalogue free. Sullivan Co., 1234 Van Buren St., Chicago, Ill.

GET cash for names, information, ideas, formulas. Turn what you see, hear and know into money. Instructive booklet for stamp. Information System, 233 Marietta, Ohio.

AGENTS—Our gold window letter proposition beats 'em all. Staibrite Co., Dept. P., Long Island City, N. Y. Established 1905.

MAKE $8 to $10 a day handling the Imperial Floor Sander—every Contractor, Carpenter and Painter buys. Nothing like it on the market. Write for our money making proposition. Imperial Pump & Tool Co., 2442 West 12th St., Chicago, Ill.

WE manufacture Packs Pineapple Eyesnip. Sample 25c. Schlicker Mfg. Co., 12 Bloomingdale St., Rochester, N. Y.

"DON'T Shout—Just Whisper," Phone-Mega makes telephone conversation easy and private; sells 50c; Bonanza for live agents. Sample 20c. Phone-Mega Mfg. Co., 504 Pine St., St. Louis, Mo.

AGENTS wanted for fast selling guaranteed household article; every housewife a buyer; no talking necessary, as the valuable premium given with each purchase gets the business; write today for particulars. Charles Sharpe, Box 943, Edgar, Wisconsin.

AGENTS—Big Summer Seller. Something new—Concentrated Soft Drinks; just add water. Delicious drinks in a jiffy. Popular for the home, picnics, parties, socials, etc. Small packages; carry in pocket. Enormous demand; agents making $6 to $12 a day. Outfit free to workers. Just a postal today. E. M. Feltman, 4766 3rd St., Cincimati, O.

WRITE for our profitable agency offer selling automatic pipe and nut wrench. Superior Wrench Co., Box 1326. Marshalltown, Iowa.

LUMINOUS Crucifix—Catholics buy on sight. Old Paduke, Paducah, Ky.

"GOLDINE" Sign Letters—1,000% profit. Particulars free. Johnston Co., Quincy, Ill.

AGENTS—Every Housewife wants our new practical fast-selling specialties. Samples and catalogue free. C. O. Urquhart, 634 West 131st, New York.

AGENTS—Get newest, quickest sellers direct from the makers; full list free. Nat'l. Agents Ass'n., C122 Michigan Ave., Chicago.

NEW Gas Saver cuts gas bills on cooking ½; saves $20 yearly; fits every gas range; sensational demonstration; sells at sight 50c; 150% profit; every gas user buys from 3 to 4. American Gas Reduction Company, 2171 Transportation Bldg., Chicago.

COMBINATION Electric Stove & Toaster operates at an expense of 1c per hour; demonstration creates sensation; costs 85c; sells at sight $3. Triumph Company, Transportation Bldg., Chicago.

AGENTS—We manufacture fastest selling household article on the market. Fine profits. Pelham Manufacturing Company, Pelham, N. Y.

100% PROFIT—"Little Giant" Doorholder and Stop; 15c; every householder buys; sample 10c; write for territory, prices. Marshall & Clemenson, 844 Home, Oak Park, Ill.

MORE Money, Less Effort. Sell our new, sanitary, "Sav-Ice" Cloth; prevents useless melting of ice, reduces ice-bills half. 200% profit. Retails at 25c. Harsch Mfg. Co., Columbus, Ohio.

INVENT something; your ideas may bring wealth; our free book tells what to invent and how to obtain a patent, through our new credit system; write today. Waters & Co., 4102 Warder Bldg., Washington, D. C.

FASTEST Dollar Seller Ever Invented: "Lumino" Changeable Letter Sign; metal sign with 270 letters; something new; every merchant buys; 200% profit. Write today. Changeable Sign Co., East 102nd Street, Cleveland.

"QUICK and Shiny" Metal Polish. Best polish made. Jennings in Dayton made $79.00 on 127 gallons. Send for sample. Cardinal Mfg. Co., 1744 Columbus Rd., Cleveland.

AGENTS—Make your own goods. "75 Genuine Moneymakers." Everyone tested, 20c. "Ideal," 3311-E, Belleplaine Ave., Chicago.

YOU can be your own boss with our Key Check outfit. Good for $5 a day stamping names on pocket key checks, fobs, etc. Sample check with your name and address, 15 cents. Pease Die Works, Dept. M., Winchester, N. H.

PORTRAIT Agents: Our goods will make you big profits. Delivery guaranteed. Rejects credited. Prompt shipments. Low prices. Send for latest catalogue and prices. Adam J. Kroll & Co., 602 Blue Island Ave., Chicago, Ill.

AGENTS—Salary or commission. Greatest seller yet. Every user pen and ink buys on sight; 200 to 500 per cent profit. One agent's sales $620 in six days; another $32 in two hours. Monroe Mfg. Co., X 6, La Crosse, Wis.

AGENTS—100% profit—sell machine to saloons. Two sales a day $15 profit. Free sample, salesmanship course to workers. Mohler, Monon Bldg., Chicago.

OWN your own business. Permanent monthly income. Carry no stock, just sample. S. O. S. Electric Pulser, new, powerful. Big special agent's proposition now. Commonwealth Mfg. Co., 460 Rialto, St. Louis, Mo.

AGENTS—400% profit. Samples for stamp. Mat Falkenstein, Sauk City, Wisconsin.

MAKE $3,000 this year. We'll show you how to start in a good business of your own. Make big money representing us in your town. No experience necessary. Write today for great proposition to wide-awake people. Darling Company, Dept. 14, Washington, D. C.

AGENTS—Sell the Primus, genuine Swedish wickless, coal-oil stoves. Smokeless, odorless. Twice the heat of gasoline at one-eighth the cost. No danger of explosion. Big profits. James Anderson & Sons, Sidney, Ohio, American distributors.

$1,000 PER Man per County. Strange invention startles world—agents amazed. Ten inexperienced men divide $40,000. Korstad, a farmer, did $2,200 in 14 days. Schleicher, a minister, $195 in first 12 hours. $1,200 cold cash made, paid, banked by Stoneman in 30 days; $15,000 to date. A hot or cold running water bath equipment for any home at only $6.50. Self-heating. No plumbing or waterworks required. Investigate. Exclusive sale. Credit given. Send no money. Write letter or postal today. Allen Mfg. Co., 121 Allen Bldg., Toledo, Ohio.

MEDALLIONS—300% profit. Make up your own goods and be independent. Catalogue free. Resag Co., 1205 Randolph St., Chicago.

HOSIERY manufacturer offers permanent position supplying regular customers in home town at mill prices. $50.00 to $100.00 per month. All or spare time. For particulars address. D. Parker Mills, 2733 No. 12th St., Phila., Pa.

ACT Quick! Automobile Gasoline going up. Sell Gaso-Tonic. Equals gasoline at 3c a gallon. Eliminates Carbon. Dollar an hour profit. Sales Guaranteed. White Mfg. Co., Dept. M, Cincinnati, Ohio.

$6 COMMISSION each sale and repeat orders. Traveling salesmen every state. Main or sideline. New, rapid selling automobile accessory used all makes cars. Samples loaned. Weekly settlements. Toledo Cable Co., 119 Davis Bldg., Toledo, O.

YOUNG Man, would you accept a tailor-made suit just for showing it to your friends? If you live in a town smaller than 10,000, write Banner Taloring Co., Dept. 272, Chicago, and get beautiful samples, styles and a wonderful offer.

WHO wants to make more money selling brushes that every household needs? Special method of getting entrance to demonstrate. Fuller Sanitary Brushes are nationally advertised—largest output—best terms and prices—western distributing stations. Your territory is valuable. Write. Fuller Brush Company, Hartford, Conn.; Rock Island, Ill.

AGENTS—Here's a brand new article, just ready for market. Make over 100% profit with satisfied customers. Every mechanic needs one, sells quickly on sight; no competition. Our proposition is a winner. Don't wait. Write for it now. The Security Aluminum Rule Holder Co., Ivanpah, Calif.

YOU can make $$$$ as our general or local agent. Household necessity; saves 80 per cent; permanent business; exclusive territory; salary or commission; free sample; credit. J. Pitkin, 113 Redd St., Newark, N. Y.

AGENTS—Stamping names on Pocket Key Protectors; sample Check with your name and address, 12c. Stamping Outfits, Emblem Checks, Check Fobs, Name Plates. Hart Mfg. Co., Desk 2, 303 Degraw St., Brooklyn, N. Y.

BIG Profits for You! Manufacture Barley Crisp. New Confection, 5c package costs you 1c. Machine instructions complete $7.50 prepaid. Send 10c for samples. Barley Crisp Co., 1205 Broadway, San Francisco.

SELL New Speednut Wrench; world's quickest nut wrench; whole kit of wrenches in one; best proposition for agents; indorsed by leading railroads and manufacturers; every auto owner a quick buyer; sells on sight to anyone requiring a wrench. Evans Mfg. Co., 608 S. Dearborn, Chicago.

AGENTS can make Big Money selling hosiery of exceptional quality at prices that cannot be secured elsewhere. Big repeater. Write for particulars today. Fisher Hosiery Co., Dept. X, 721 Sterling Place, Brooklyn, N. Y.

AGENTS—Brand new specialty Aluminum Triplicate Sauce Pan with detachable handle. Cooks 3 different foods on one burner. Saves gas. Lasts lifetime. $100 to $300 per month easy. Send for our catalogue of 400 other specialties. American Aluminum Mfg. Co., Div. J. 10, Lemont, Ill.

WE manufacture food products. Rapid sellers. Big profits. Exclusive agency. R. Colvin Company, South Bend, Ind.

CARPENTER agents get new Roof-Framing Gauge Free. Unequalled. Marks seventy pitches. Each in five minutes. John Parkhill, Rochester, Minnesota.

NON-BREAKABLE Lamp Chimneys and Smokeless Burners are sure sellers. F. Finch's, Grand Rapids, Mich.

MAKE your own Extracts and Perfumes. H. Lake Co., Adair, Ill.

AGENTS—Ho-Ro-Co Skin Soap and Toilet Goods plan beats everything for agents' profits. Rothco, 212 N. 2nd, St. Louis, Mo.

EARN $2 each call and get a Reeves $5 Vacuum Cleaner free by showing it to your neighbors. Reeves, 56 Broad St., Milford, Conn.

AGENTS—Steady Income. Large manufacturer of Handkerchiefs and Dress Goods, etc., wishes representative in each locality. Factory to consumer. Big profits, honest goods. Whole or spare time. Credit given. Send for particulars. Freeport Mfg. Co., 59 Main St., Brooklyn, N. Y.

STOP Here! Let me start you in a home business that will bring you money every day. Experience unnecessary. Spare time. No canvassing. I furnish everything. Send for proofs. Voorhies, Desk C. R., Omaha, Neb.

AGENTS—50 Calling Cards 10c. F. Shepard, Rome, N. Y.

NEW $2.50 pocket adder. Sell 10 daily easy. Excellent profit. Everyone buys. No competition. A. Bassett, 5921 Indiana Ave., Chicago.

RELIGIOUS novelties, quick sellers, big profits, fine proposition for Agents. Write for particulars immediately. Novelty Altar Co., Dept. P, Stamford, Conn.

AGENTS—Make real money this year; not "paper money." Sell our wonderful Luminous articles. "They shine in the dark." Crucifixes, Match Boxes, Pull Chain Bulbs, Switch Plates, Clocks. Startling! Everlasting! Mysterious! Pioneer Portrait Co. (Luminous Specialists), 1259 West 63rd, Chicago.

AGENTS—Sell rich-looking imported 36x68 Rugs, $1 each. Carter, Tenn., sold 115 in 4 days. Profit, $57. You can do same. Write for sample offer selling plan; exclusive territory. Sample rug by parcel post prepaid, 98c. H. Condon, Importer, Stonington, Maine.

1916's SENSATION! Eleven-Piece Toilet Article set selling like blazes at $1, with $1 carving set free! Enormous profits! Tremendous hit! Engle made $51.00 first week. Write quick! Pierce Co., Dept. P, 906 Lake St., Chicago.

LADY or gentleman, fair education, to travel for old-established firm. No canvassing. Salary, $936 per year, payable weekly, pursuant to contract. Expenses advanced. Address G. M. Nichols, Philadelphia, Pa., Pepper Bldg.

EASY, pleasant work for Mechanics, Shop Men, Clerks, during spare hours, will add many dollars to their salaries. Also want persons who can give full time. Big wages assured. Novelty Cutlery Co., 67 Bar St., Canton, Ohio.

I WILL start you earning $4 daily at home, silvering mirrors; free instructive booklet. G. F. Redmond, Dept. 306, Boston, Mass.

AGENTS make $100 monthly selling our 500 handy household articles. Catalogue free. Scheff Company, Desplaines, Ill.

$15.00 MADE first day by 13-year-old boy with Shomescope. Woman made $8.00 first hour. Particulars free. Shomescope Mfg. Co., 523 W. 13th St., Kansas City, Mo.

AGENTS—$5 daily selling our Handy Tool, 12 articles in one. Lightning seller. Sample free. Thomas Mfg. Company, 762 North St., Dayton, Ohio.

MAKE 100% profit selling new patent polishing cloth to Automobile owners, garages and the home. Sells on sight. Write for particulars or send 25c for sample of 200 square inches. Address, Dept. C, The von Oeyen Sales Company, 720 Helen Ave., Detroit, Michigan.

SOLICITORS: Make $50 weekly; each merchant and physician a prospect; free outfit. One man made $145 first ten days, that was last June, he is still working. Address, Secretary, 343 Wells Bldg., Quincy, Illinois.

$75 EVERY week you sell Big 4 Pilots for Ford Cars. Makes steering easy. Every sale makes a booster. Get prices and description at once. G. M. Tilford, Dallas, Texas.

BIG Opportunity—Agents introduce high grade repeat-order specialties. Quick sales; big profits. Send for particulars. Annville Specialty Co., Palmyra, Pa.

MAKE Big Money, sell the latest household article. Every housewife buys when shown. One agent sold 10,000 in a week. Sample and particulars 10c (coin). Marvel Mfg. Co., Desk A, New Haven, Ct.

AGENCIES WANTED

ARTICLES wanted, suitable Household, Office, Workshop, for Trade Houses, Mail Order, Agents, Canvassers, Streetmen, Fairmen, from manufacturing companies only. Particulars, Catalogues, Samples, Absolute lowest Jobbers' terms, to "Webstercо" 41, Newington Butts, London, S. E., England.

USEFUL Articles from manufacturers. Agents all over Canada. A. Jarvis, Runnymede Rd., Toronto, Canada.

WANTED—Agencies for reliable Manufacturers and Patentees. Novelty Sales Co., Waterville, Wash.

EDWIN A. MANSFIELD & CO., 12, Beckenham Road, New Brighton, England, will be glad to hear from firms who wish specialties to be placed on British and Continental Markets.

WE want to represent manufacturers in Washington, Idaho and Oregon, articles retailing from $1.00 to $5.00 preferred. Northwestern Sales Co., Spokane, Wash.

SALESMEN WANTED

WE Want Salesmen. Our line—Groceries, Provisions, Paints, Automobile and Machine Oils, Roofing, Stock and Poultry Food. Sells to Farmers and other citizens who eat, have buildings, or own live stock. Sells because the goods have the quality and the price that we can give by selling in large quantities direct to the consumer. Our salesmen make $500.00 to $5,000.00 per year. Their ability and activity govern that. We give them the right goods and at the right price and the fact that all of them don't make the big money only proves that all men are not equal as salesmen. You or anyone else who answers this ad can get our proposition, but don't answer unless you know that you can't make a dollar without putting in a dollar's worth of work. Hitchcock Hill Co., Wholesale Grocers, Chicago, Ill.

A NEW way to make money—$10 to $30 for information only. No selling, soliciting, no real work. We want associates with us—each city—in building and operating "M-S" improved real estate. (Patent construction insures 50 to 100% greater income.) Our hardest job is not securing their co-operation, but to find right people. We will pay you $10 to $30 or more for information you now possess. Don't delay. Cash in on this; write Sales Director, Merrill System, Monon Building, Chicago.

UNQUESTIONABLY, above others, every bank account holder buys for $5.00 the O. V. C. Check Protector Machine. Free sample, perfected selling plans to right man. Ovici, 25 West 42nd St., New York.

WANTED—500 Salesmen to sell Magic Motor Gas. One quart, price $2, equals 50 gallons gasoline. Greatest product ever discovered. Large profits. Auto Remedy Co., Eighth Ave., Cincinnati.

DA-NITE-FLASH Art Glass signs with Art Glass changeable letters; hundred beautiful signs in one; quality excellent, price low. Manufactured by McReynolds & Co., 307 Grand Ave., Milwaukee, Wis.

SALESMEN—Our Force Feed Oiler works with a plunger. Successful salesmen wanted everywhere to represent us. An excellent side line. State territory covered. E. M. De Camp, 920 Lawrence Ave., Chicago.

SALESMEN: Leatherette Change and Bill Fold; handiest purse made. Advertising Novelties. Security Mfg. Co., Dept. A, 222 N. Wabash. Chicago.

TRAVELING Men Wanted for Money-Making Side Line. Largest Vacuum Sweeper Factory in the world wants side-line men in all States to sell Vacuum Sweepers from photographs. No samples to carry. Liberal commission on all re-orders. Big season right at hand. Act quickly. Write fully—state territory covered and trade you sell. United Vacuum Sweeper Co., 1315 W. Congress St., Chicago.

PROGRESSIVE Salesmen sell Dunlo Rug Border. Mill to merchant prices, liberal commission. Write for two pound samples. J. C. Dunn & Co., Camden, N. J.

SALESMEN: Acquainted with merchants. Large demand. Lib. comm. Pocket samples. Wirth Salesbook Co., Chicago.

EXCLUSIVE county rights. Sell Tankii; modern auto fuel. Profitable. Tankii Chemical Co., Cleveland, Ohio.

HELP-A-PHONE; the profitable side line for salesmen. Write Ebnard, 415 Belden Ave., Chicago.

NEW auto fuel; one-third cheaper; unlike any other; County and District agencies open; 10-year contract; guaranteed. Inajiffi Fuel Co., Akron, O.

WANTED—Advertising moving picture film representatives. $50 week up possible. Animated Advertising, 3028 S. Michigan Ave., Chicago.

FACTORY foremen or employes or tradesmen can add $100 to $200 monthly to their incomes acting as our representatives. Spare time. No capital. We furnish everything. Recommendations from many prominent bankers. We want one representative in each town. Write at once for particulars. Address B. F. Woods, Jr., 230 Stewart Bldg., Houston, Texas.

WANTED — Representatives everywhere. Exclusive territory. Gold sign letters for stores and office windows. Any one can put on. Write today for free sample. Metallic Letter Co., 403 N. Clark St., Chicago.

SALESMEN wanted to sell Shinon Products to retailers and jobbers. All trades handle. Consumption big. Lowest prices and attractive deals. 18-year quality reputation. Big commissions net handsome income. All or part time. Shinon Co., Rochester, N. Y.

HOW much do you earn? Wanted—Live, energetic men over 25 years for small towns and country trade; we teach you how to easily make $150 to $500 monthly selling groceries, paints, oils and stock remedies—all necessities; big line, big money; build homes and bank accounts as hundreds do; regular trade quickly, easily covered; old, established, reliable house; ask your banker. Write today for our booklet, "The Way to Success in Business." John T. Sexton & Co., Wholesale Grocers, Lake and Franklin Sts., Chicago.

SIDELINE salesman acquainted with retail or wholesale cigar trade, to sell new, highly successful utility. If you have an established trade and won't shy at $10.00 a day on the side, write Universal Mfg. Co., 660 Locust, St. Louis, Mo.

SALESMEN — Make Big Money on our Convex Portraits 38c, Frames 35c, Glass 20c. Largest house in America. Est. 15 years. Samples Free. The Culver Co., Box 104, Westerville, O.

SALESMEN—Get our plan for Monogramming Automobiles and Motorcycles by transfer methods. Very large profits. Motorists' Accessories Co., Ashland, O.

SALESMAN. Sell beautiful 28x58 Artzkraft felt rugs for $13.50 per doz. Your profit, $3 per doz. Kelso, Battle Creek, Mich., sold 30 doz. last week. His profit, $75. Write for exclusive territory and selling plan. Prepaid sample, 75c, refunded on first order. H. Condon, Mfgr., Stonington, Maine.

EARN $5,000 to $20,000 yearly. New business necessity. Retails $5 to $200. 100—200% profit. Purchaser satisfied or money refunded. No competition. Exclusive territory. Free samples. Sayers, 408 Wainwright, St. Louis.

HELP WANTED

GOOD Position, excellent salary for you by training as Topographic Draftsman for Government service. Complete course by mail; also Mechanical Drafting, with which a set of Alteneder instruments is furnished. Get particulars now. Columbia School of Drafting. McLachlen Bldg., Washington, D. C.

CHAUFFEURS, get $18 week. Learn while earning. Sample lessons free. Franklin Institute, Dept. J-802, Rochester, N. Y.

GO on the Stage. Vaudeville career offered you. Experience unnecessary. Managers endorse my method. Instructive vaudeville book free. Write today. Frederic LaDelle, Sta. 10, Jackson, Mich.

STOP Here! Let me start you in a home business that will bring you money every day. Experience unnecessary. Spare time. No canvassing. I furnish everything. Send for proofs. Voorhies, Desk C. R., Omaha, Neb.

WANTED—Men-Women. $75.00 month. List Government Jobs open, free. Franklin Institute, Dept. J-21, Rochester, N. Y.

GET a Government Job! See ad on page 38. Write now—today! Patterson Civil Service School, Rochester, N. Y.

FIREMEN and Brakemen: $100 monthly. Experience unnecessary. Hundreds needed by the best railroads everywhere. Particulars free. 810 Railway Bureau, East St. Louis, Ills.

THOUSANDS Government Jobs Now Obtainable. List free. Franklin Institute, Dept. J-21, Rochester, N. Y.

$10 DAILY refinishing chandeliers, brass beds, etc., by new method, producing amazing results; no capital or experience necessary; write for information. Gunmetal Co., Ave. G, Decatur, Ill.

WANTED—Men and women to qualify for Government positions. Several thousand appointments to be made next few months. Full information about openings, how to prepare, etc., free. Write immediately for booklet CG-29. Earl Hopkins, Washington, D. C.

U. S. GOVERNMENT wants Clerks. Men—Women, 18 or over. $75.00 month. Write immediately for free list of positions now obtainable. Franklin Institute, Dept. J-21, Rochester, N. Y.

$20 TO $35 per month extra money to any employed person without interfering with regular work. No seling, no canvassing. Positively no investment. Unemployed need not apply. Address The Silver Mirror Co., Inc., 119 W. Madison St., Chicago, Ill.

PLEASANT spare-time work; mailing circulars. Good pay. No scheme. Details free. Home Pub. Society, 46 N. 12th, Philadelphia.

EARN $20 weekly collecting names and information. What you see, hear and know is worth money. Send stamp for instructive booklet. Information System, 232 Marietta, Ohio.

MEN—Women, Wanted, $75.00 month. Government Jobs. Vacancies constantly. Write for list positions now obtainable. Franklin Institute, Dept. J-21, Rochester, N. Y.

CIVIL Service Examinations open the way to good Government positions. I can coach you by mail at small cost. Full particulars free to any American citizen of eighteen or over. Write today for booklet CE-29. Earl Hopkins, Washington, D. C.

MEN wanted to make toy soldiers as side-line or business larger scale. War stopped importation; enormous demand here. We buy everything till Christmas, paying $1.50 to $21. Complete casting outfit, $2.50. Booklet, information free. Toy Soldier Manufacturing Co., 32 Union Square, New York.

BRIGHT man guaranteed $100 position when competent. Some special home preparation necessary. Write Civil Service School, Denver, Colo.

BE a Detective; $50, $100 weekly; travel over the world. Experience unnecessary. American Foreign Detective Institute, 106 Chemical, St. Louis.

THOUSANDS Men and Women Wanted. Get U. S. Government positions. $75 month. Steady work. Common education sufficient. Write immediately for free list of positions now obtainable. Franklin Institute, Dept. J-21, Rochester, N. Y.

BIG money writing Photo-plays; details free to beginners. No correspondence course. Producers League, 230 Wainwright, St. Louis.

INVENT something; your ideas may bring wealth; our free book tells what to invent and how to obtain a patent, through our new credit system; write today. Waters & Co., 4102 Warder Bldg., Washington, D. C.

FIREMEN, Brakemen, all railroads everywhere; $120 monthly; experience unnecessary. Promotion, conductor, engineer, $150-$200. Railway Association, Dept. 298, Brooklyn, N. Y.

WANTED—Young Men as Railway Mail Clerks, $75.00 month. Sample examination questions free. Franklin Institute, Dept. J-21, Rochester, N. Y.

DISTRIBUTORS—Wanted of Advertising matter everywhere (good pay); send dime for Contract Magazine (none free). Address Oliver A. Barkley, Mount Pleasant, Pennsylvania.

$6 COMMISSION each sale and repeat orders. Traveling salesmen every State. Main or sideline. New, rapid selling automobile accessory used all makes cars. Samples loaned. Weekly settlements. Toledo Cable Co., 118 Davis Bldg., Toledo, O.

LEARN auto trade in most modern school on Coast. Courses practical and complete; expert supervision; time unlimited; reasonable rates. Will help you earn your living while learning. Catalog free. National School of Engineering (Established 1905). Los Angeles.

PROSPECTIVE Chauffeurs, Salesmen, etc. Learn repairing and driving any car. Small cost. Earn $20 and up weekly. Modern Auto Co., 1381 Ridge Avenue, Philadelphia, Pa.

SILVERING mirrors. Plating tableware, auto-brass. Home booklet plans free. Clarence Sprinkle, Dept. 28, Marion, Ind.

DETECTIVES earn from $25 to $100 per week and traveling expenses. We show you how. Write National School of Detectives, Room 536, 489 Fifth Avenue, New York.

BE a Detective—Earn from $150.00 to $300.00 per month. Travel over the world. Write C. T. Ludwig, 340 Westover Building, Kansas City, Mo.

GOVERNMENT Examinations. Most thorough preparation, $5; returned if not appointed; particulars free. American Civil Service School, Washington, D. C.

WANTED—An Idea! Who can think of some simple thing to patent? Protect your ideas; they may bring you wealth. Write for "Needed Inventions" and "How to Get Your Patent and Your Money." Randolph & Co., Patent Attorneys, Dept. 144, Washington, D. C.

I WILL start you earning $4 daily at home, silvering mirrors; free instructive booklet. G. F. Redmond, Dept. 306, Boston, Mass.

BECOME Detectives. Large salaries; easy work. Write Chief Wagner, 1243 Lexington Avenue, New York.

PARTNERS WANTED

PARTNER wanted to manufacture patent hayfork; cost 25c each. P. O. Box 69, Haverhill, Mass.

WANTED

WANT Oxy-Acetylene Welding Outfit in exchange for industrial stock. Write for particulars. Address Box 12, Lomax, Ill.

75c YOUR old false teeth per set. Jos. Lynn, 198 W. Springfield St., Boston, Mass.

FOR SALE

REAL bargains in high-grade Cameras, Lenses, Kodaks, Binoculars, Microscopes, Surveyors' Transits, etc. All goods used, but equal to new. Away below regular prices. Write us today. David Stern Co., 1047-F W. Madison St., Chicago.

FIFTY-SIX inch new Simplex Ironer, $30. Also Motorcycle. S. J. Griffin, Ogden, Utah.

BARGAIN—Box Ball Alley in good second-hand condition. Cost $200.00. Will take $40. Box 323, Corinth, Miss.

FOR Sale—Elk, sheep and deer heads. Reuben Sayler, 497 Broadway, Dayton, Ohio.

CIVIL Engineering. I. C. S. course, $25.00. For particulars address Robt. Stoeser, 1456 Fletcher St., Chicago.

FIELD and Marine, Day and Night Glasses, with beautiful case. 25-mile adjustment; $30 value, only $7.50. Money back if not satisfied. Weil's Curiosity Shop, 20 S. Second St., Philadelphia, Pa.

NEW One Hundred Dollar Standard Visible Typewriter for Thirty-five Dollars. Millison Office Supply Co., Wichita, Kansas.

FIELD Glasses; a few pairs left. 9 power. $6.00. Zehrbach, Leipsic, Ohio.

FOR Sale—Part interest in practical invention; cheap. Sanders, 116 W. Van Buren St., Room 906, Chicago.

BATTLE Creek Union Steam Pump, size 5x3x6, nearly new, $50. A. F. Eyclesleymer, Niles, Mich.

LARGE Rife Hydraulic Ram, 8" drive pipe. First-class condition. Cost $400, will sell for $150. Merritt W. Pharo, Bourse Bldg., Philadelphia, Pa.

TYPE and Printing Material at bargain prices. Now is the time to buy. All sizes rebuilt Job Presses very cheap. Catalogue free. Philadelphia Printers' Supply Co., 14 So. Fifth St., Philadelphia.

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COMPLETE Threshing Outfit. Bargain. Haypress, Motorcycle, Microscope, Moving Picture Outfit, Music Box, Large List. Part trade. Offers? Fleury, Avoca, Michigan.

EXCHANGE Law Books, Camera, Printing Press, other articles, for typewriter or offers. Rankin, Spencer, Iowa.

YOU can sell or exchange almost anything through these classified pages. Tell me what you have and I'll send you some interesting information. No obligation whatever. Write me today. F. W. Johnson, Manager of classified advertising, 6 N. Michigan Ave., Chicago.

WE buy and sell everything needed for theatres and road shows. We sell moving picture machines, $50; Films, $3.00 a reel; Motors, $3.00 up. H. D. Theatre Supply, 711 South Kedzie Ave., Chicago, Ill.

LET'S Swap! Hundreds of offers. Three months Dime free advertising. Swap Bulletin, Detroit.

GUNS, SPORTING GOODS, ETC.

PETERS bait 25c; bait tie 10c; absolutely weedless fish hook 25c; collapsible line-drying reel $1. Fits any tackle box. Used by all reel fishermen. R. D. Peters, Mgr., Peters Bait Co., Knox, Ind.

DON'T Be Mushy. Postal will bring catalogue of Famous Home Exercisers, direct from the Manufacturers. Peerless Athletic Supply Co., 383 Pearl St., Brooklyn, N. Y.

FIREARMS—Old-time and modern. Buy, sell, exchange all sorts. Stephen Van Rensselaer, 49 Front St., New York City.

ENGINE CASTINGS AND BLUEPRINTS

STEAM Engine Castings for ⅛ hp., $3; ¼, $5, and ½, $12. Modern Model Eng. Co., 3001 N. Central Park Ave., Chicago.

GASOLINE Engine Castings, with drawings. Cheap. Catalog for stamp. Novelty Manufacturing Co., 853 West 6th St., Cincinnati, Ohio.

FLOUR & FEED MILLING MACHINERY

SPECIAL bargains in second hand Attrition mills, burr mills, crushers, corn shellers, bran dusters, dust collectors, purifiers, reels, double, single, 2 and 3-pair high roller mills, sieve bolters, receiving separators, scourers, etc. Write for description and prices. Sprout, Waldron & Co., P. O. Box 429, Muncy, Pa.

MACHINERY, TOOLS AND SUPPLIES

100 NEW Vises $1.00 per inch width of jaw, all sizes 2½ to 5 inches. Send for circular. Lucas & Son, Fox St., Bridgeport, Conn.

SIDNEY Tool Co. Combination Tenon Machine and Mortiser. Nearly new. Price $110. Boyd M. Heltman, Bellevue, O.

MACHINERY for manufacturing chewing gum. For sale. Crone, 334 Genesee, Buffalo, N. Y.

PULLEYS, Gears, Sprockets, Shafting, Hangers; see display ad this issue. W. A. Jones Foundry & Machine Co., Chicago.

ENGINE Lathe, swings 9½ in., takes 25 in. between centers. Complete set gears cutting all size threads 3 in. to 40 in., $45.50. Grammes & Sons, Allentown, Pa.

"RED Devil" Mechanic's plier (drop forged steel). Most efficient. 5" size 60c. Style 50. Tool booklet free. Smith & Hemenway Co., 161B Chambers Street, New York City.

STEEL Name Stamps for marking tools. 3 initials, 75c. Names with initials, 20c per letter. Brass and steel dies for all purposes. Partridge Scofford Co., 12A West 10th St., Kansas City, Mo.

LATHES—Ten second hand speed lathes, all prices; send for list. Lucas & Son, Bridgeport, Ct.

FOR Sale: New Power Hack Saw, capacity 4"x4", $16.75. New 10" Sensitive Bench Drill Press, complete with chuck, capacity ⅜", $15.00. Passman Bros., 30 S. Green St., Chicago, Ill.

FOR Sale: Automatic Double Spindle Screw Machine. Will take stock up to ⅞. Goshen Eyelet Co., Goshen, Ind.

ENGINES, MOTORS AND DYNAMOS

FOR Sale—Cheap—Semi-Speed Launch, 40 HP. Trebert Engine. Eldredge-Whittaker Hydroplane Erd Engine. 18-25 Sterling Engine complete. Elbridge 3-cylinder, 27 HP. Engine. C. D. T., 818 Granite Bldg., Rochester, N. Y.

GUARANTEED rebuilt alternating and direct current motors. Bargain prices. Reliable makes only. Westinghouse, Wagner, General Electric, Century, Emerson. Sizes from 1/30 H. P. upwards. Satisfaction guaranteed or money refunded. Write today for illustrated pricelist supplies and motors. Hyre Electric Co., 613 WT. South Dearborn St., Chicago.

2-HORSE Marine Motor $20. Frazer Bros., Adams, N. Y.

SACRIFICE—Marine Engine Sale. Get list. Morley, Harbor Beach, Mich.

FOR Sale—3½ Hp. Gasoline Engine (new). Whitcomb, Saugatuck, Mich.

REMARKABLE Bargain: 16hp. 3-cylinder 2-cycle Knox Marine engine, Paragon gear, jump-spark outfit, carburetors, propeller in perfect condition, $180. Address: B. C. Bixby, Newton Centre, Mass.

REAL Bargains: Dynamo, $20; 3-Hp. M. C. engine, $16; large ammeter, $6. Hall, 632 W. 62nd St., Chicago.

100 KW., 250-Volt, Direct-Current Triumph Generator. First-class condition. An excellent bargain. The D. Hummel Building Co., Station B, Cincinnati, Ohio.

DYNAMOS, 30-50-100 light. Payments $10 per month. Hobert Brothers, Troy, Ohio.

AEROTHRUST Motor in good order at $35. Russell & Foland, Mt. Pleasant, Mich.

BANKRUPTCY Sale: A. C. motors, all new. ¼ h. p., $15; ½ h. p., $30. Small generators, $8. Motor generators and other size motors less than factory cost. Johnston, Evans Ave., Ingram, Pa.

AUTO Engines—Atlas 40 hp., 4 cylinder, $35; Hupp, 20 hp., E. M. F., 30 hp.; also 2 Canoe Engines, $20 each. Johnston, Evans Ave., Ingram, Pa.

85 H. P. Gas Engine for sale. Good condition. 2 cyl., 10" bore, 14" stroke, R. P. M. 250. Write Adv. Dept., Allen Motor Co., Fostoria, Ohio.

TEN second hand engines cheap. Send for description. Lucas & Son, Bridgeport, Conn.

SMALL Auto motors, 4 cylinder, 4 cycle 2-5/8x4, bare or equipped. Bargains. Universal Motor Co., Oshkosh, Wis.

WESTINGHOUSE Vertical Gas Engine. 40 H. P. Now running. In best possible condition. Selling because of purchase of a larger unit. Delivery at once. The Acklin Stamping Co., Toledo, O.

REBUILT Engines—We have on hand a number of rebuilt "Buffalo" engines, guaranteed, at greatly reduced prices. Write for bargain list. Buffalo Gasoline Motor Co., 1293-1305 Niagara Street, Buffalo, N. Y.

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REMOVES Grease and Dirt instantly without water. We guarantee that one tablespoonful of Waterless Washer will remove grease in one minute from hands that have been dirty for years, and leave them snow white. Removes quickly dirt, ink stains, or grease from the most delicate fabrics without slightest injury. Wonderful for sore feet, chapped hands, and cleanses cuts; fine shampoo, greatest help in washing clothes ever discovered. Once used you will never be without it. Used in Europe for years; we are offering it now for the first time in America. Wonderful, startling, and positively harmless, yet any child can make in your own kitchen. For $1 we send, prepaid, enough material with instructions to make 16 pounds. Money refunded if not satisfactory. Waterless Washer Laboratories, 1428 Michigan Blvd., Chicago.

BOATS, LAUNCHES, ETC.

FOR Sale: Truscott Launch, 25 ft. (chairs), 12 hp., 2-cyl. eng. Monahan eng. 1 mo. old. Magneto and clutch, $250. Also 15 hp. 2-cyl. eng. used 7 mo. F. S. Kenfield, Augusta, Mich.

ELECTRIC Portable Propeller for any rowboat. Attached and detached in a moment; are absolutely practical. Selling half price. J. Hopwood, Menomonie, Wis.

BUILD your own Steel boat from patterns. Material furnished, also finished boats. Catalogue free. Darrow Boat Co., Albion, Mich.

MOTORCRAFT Encyclopedia—A 150-page book that tells 1001 things every motor boatman should know. How to overcome engine troubles. Price $1, postpaid. Popular Mechanics Book Dept., 6 N. Michigan Ave., Chicago.

FOR THE SHOP

PROTECT your arms from grease and dirt. Wear our "Oil-Proof Sleeves," 30c a pair. Waterproof Novelty Co., 50 W. 22nd St., N. Y. C.

JUST Published—Popular Mechanics Shop Notes for 1916—529 Easy Ways to Do Hard Things in every department of mechanics. Over 600 illustrations. 224 pages (size 6½x9½ in.). Price 50 cents, postpaid. Popular Mechanics Book Dept., 6 N. Michigan Ave., Chicago.

FOR That Boy—He will appreciate a copy of the great boy's book "The Boy Mechanic" that tells about 700 different things for boys to do and has 800 pictures. 480 (7x10) pages, cloth, big, handsome book for the price, $1.50 postpaid. Popular Mechanics Book Dept., 6 N. Michigan Ave., Chicago.

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BLACKSMITHS, Listen: Wear the smile that won't come off, by doing hard jobs easy with Toy's Modern Methods on blacksmithing. Making all welds solid, tempering all tools to a standard with colored tempering charts. All for one dollar. Samples free. W. M. Toy, Sidney, Ohio.

ELECTRICAL

ILLUSTRATED wholesale pricelist supplies and motors. Write today for guaranteed bargains. Hyre Electric Co., 613 TF, South Dearborn St., Chicago.

TATTOOING Outfits, Electric and Hand, $1 up. Roberts Company, 635 West Ave., Buffalo, N. Y.

DRY Batteries and Their Construction for All Purposes. A practical handbook of 60 pages with 30 illustrations dealing with batteries for automobiles, gas engines, medical and coil work, electric bells, alarms, telephones, experiments, etc. Price 25 cents postpaid. Popular Mechanics Book Dept., 6 N. Michigan Ave., Chicago.

PATENTS Secured through Credit System. Send Sketch. Free Search and Certificate of Patentability. Book and List of Patent Buyers Free. Waters & Co., 4280 Warder Bldg., Washington, D. C.

PRACTICAL Electrics—Universal handy book on every-day electrical matters, alarms, batteries, bells, carbons, connections, coils, dynamos, wires, lamps, motors, telephones, etc. 135 pages, 126 illustrations. 25c postpaid. Popular Mechanics Book Dept., 6 N. Michigan Ave., Chicago.

PRACTICAL Applied Electricity—Here is a book written in plain English for the practical man. There has been great need of such a work. Practical examples are given to illustrate theory and this serves as a greater aid in fixing the subject matter firmly in the mind of the reader than a bare statement of principles, laws, etc. Pocket size, 450 pages, 323 illustrations, leather. Price $2.00 postpaid. Popular Mechanics Book Dept., 6 N. Michigan Ave., Chicago.

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A STAMP Album, A Collection of rare Mexican War stamps, incl. Madero, etc., 100-page catalog. Perf. gauge and mill. scale, coupons, etc., all for 5c. App. sheets 60% to 80% comm. Agents Wanted. We buy stamps. Hussman Stamp Company, St. Louis, Mo.

STAMPS, 75, all different, free. Postage 2c. Mention paper. Quaker Stamp Co., Toledo, Ohio.

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129 DIFFERENT Stamps 7c. Fine approvals. E. R. Pride, Dept. C, Honeoye Falls, N. Y.

FREE—201 Different Foreign Stamps, 185 European war packet, 25 Persia, 50 Africa, 50 Australian, 100 United States, 60 Japanese, 50 Sweden, 65 British Colonials with Mekeel's Stamp Weekly, Beverly, Mass., six months. Choose one. Remit 25c. Mention magazine.

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1,000 STAMPS from 30 different countries, 13c. Lufbery, Wallingford, Conn.

STAMPS—50 China and treaty ports 10c. Wolverine Stamp Co., Centreville, Mich.

FREE! 25 different used United States Stamps including Postage, Revenues, Envelopes and Dues, to applicants for our high-grade approval selections. Send 2c for postage. The Edgewood Stamp Co., Dept. H, Milford, Conn.

BRAZIL—1,000 Brazilian stamps (80 varieties), value Stanly Gibbons £8 free for $4. Order now. H. Carvalho, Goncalves, Dias 31, Rio Janeiro, Brazil.

25c BUYS $1.50 catalog value, Nicaragua. Premiums. H. Chitraro, 500 W. 123d St., N. Y. City.

45 DIFFERENT Stamps from Warring Nations, Monster Australian packet, Canadian packet, Tasmanian packet, 10c. C. Martin, Iroquois, Ont.

STAMPS. Send for our low priced approvals. Premium given to new customers. Ideal Stamp Co., 558 Scott St., Milwaukee.

BOYS, get a set of parcel post stamps before too late, low prices. E. H. Frank, 939 W. 5, Cincinnati, O.

FREE! Rare New Zealand war stamp for requesting Colonial approvals. Hanlon, Box 24, Schenectady, N. Y.

AMERICAN Packet Free—Old Issues, Commemoratives Galore, Dues, Revenues, etc., 2c postage. Midland Stamp Company, Midland, Ontario.

25 DIFFERENT British Colonials to applicants for stamps on approval. Postage 2c. Nickles, 122 Florida Ave., Washington, D. C.

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PACKET "A" 100 varieties foreign, 20c—worth the money! Desirable stamps on approval, to collectors with satisfactory references. F. J. Pope, Box 45, Charlotte, Vermont.

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STAMPS—12 different from warring nations, 10c; 10 different foreign coins, 15c; 20 Belgian stamps, 10c. Lists free. Toledo Stamp Co., Toledo, Ohio.

LOW priced approvals. Mention paper and receive unused Department Stamp Free. S. E. Colman, 634 Keefer Place, Washington, D. C.

STAMPS—105 China, etc., stamp dictionary and list, 2c. Bullard, Sta. A, Boston.

STAMPS sent on approval at 70% discount. Precancels, ½c each. Reference required. Emory Renoll, Hanover, Pa.

PACKET of 23 stamps; no two countries alike, 500 hinges. Set of $1 and $2 U. S. Rev., all for 5c. Mention paper. Miami Stamp Co., Toledo, Ohio.

107 PHILIPPINES, etc.; new paper four months, 10c. Year 25c. Philatelist, Norfolk, Nebraska.

HAYTI 1898, 8 varieties, 15 cents; 1904, 6 varieties, 15 cents; ditto surcharged, 20 cents. Approvals. Neel, 880 Clarkson Ave., Brooklyn, N. Y.

RARE COINS

WILL pay $750.00 cash for $5 gold piece dated 1822 (without "In God We Trust"); $50.00 for 1853 half without arrows; $5.00 to $50.00 cash for large cent 1799, etc. We pay cash premium for all large cents, eagle cents, 2c pieces, etc., and all rare U. S. and foreign coins, bills and stamps to 1912. Thousands of rare coins wanted. Many valuable pieces are in circulation. Send 4c. Get our Large Illustrated Coin Circular containing valuable information. It may mean much to you. You certainly have nothing to lose. Send to Numismatic Bank of Texas, Dept. H, Fort Worth, Texas.

THREE Large United States Cents 25c. Six 45c. Moore Coin Company, Commerce, Texas.

OLD Coins. Spring Catalogue, large list coins for sale (Free). Catalogue quoting prices paid for coins, ten cents. William Hesslein, 101 Tremont St., Boston, Mass.

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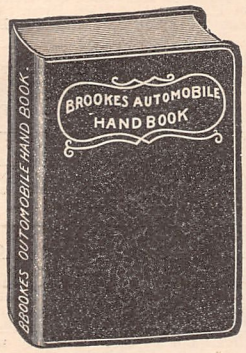

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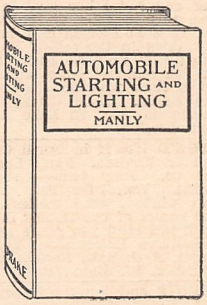

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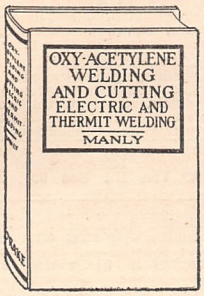

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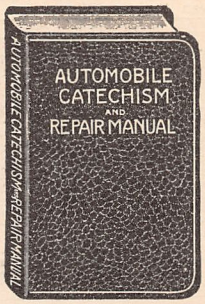

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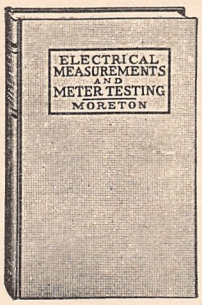

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Continued from Page 32

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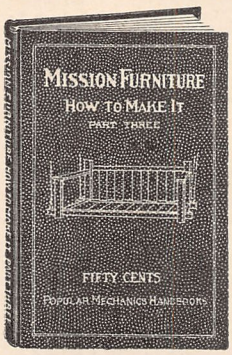

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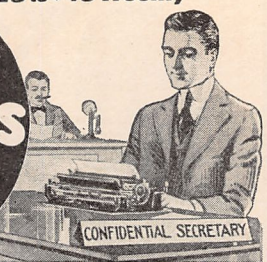

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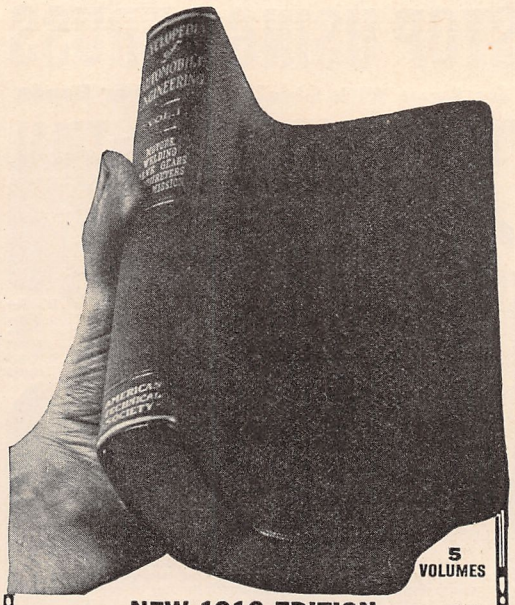

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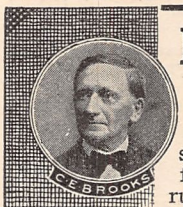

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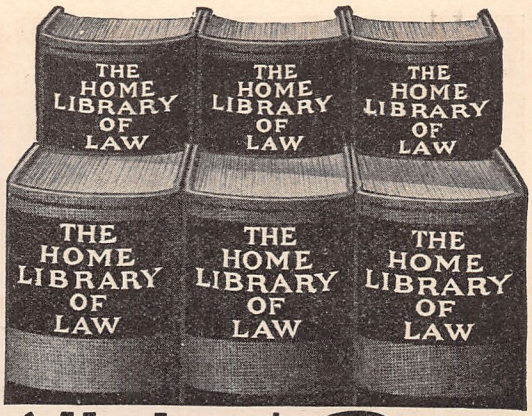

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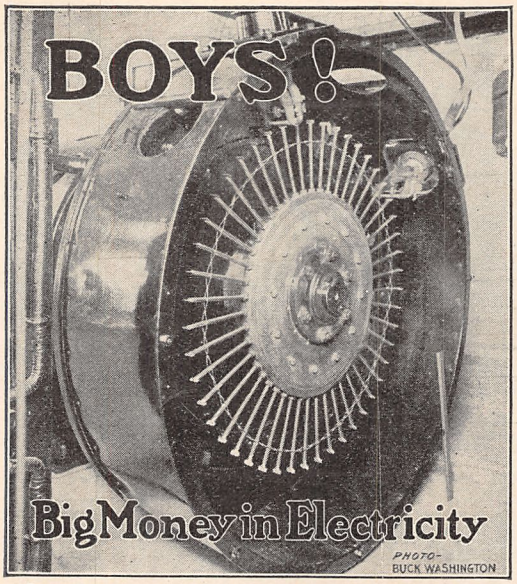

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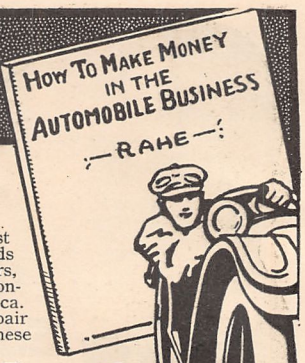

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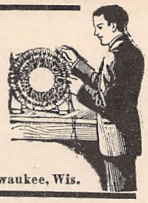

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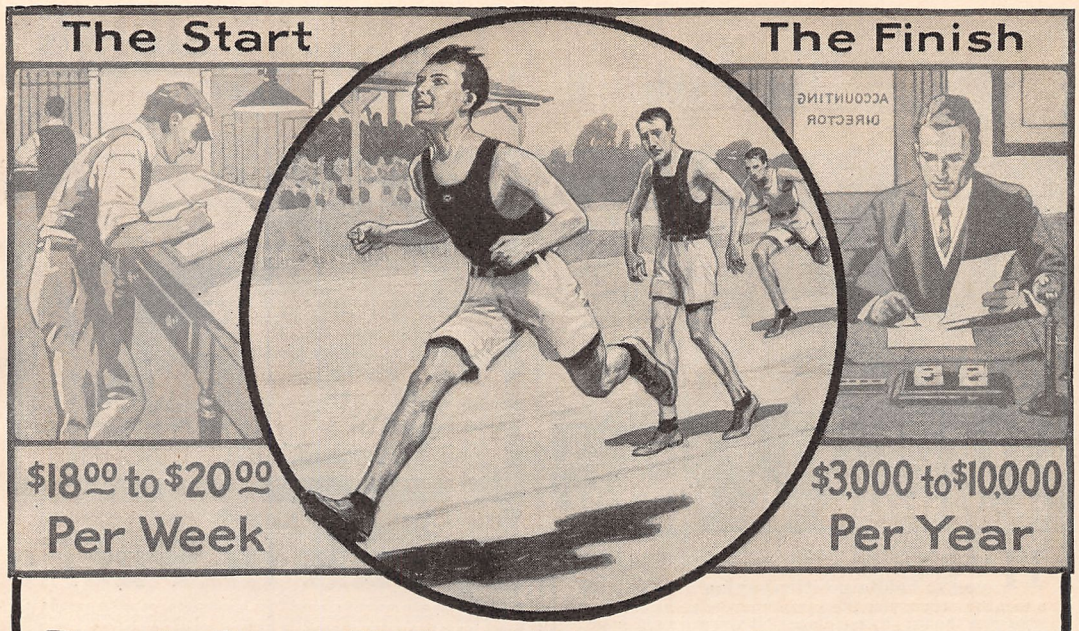

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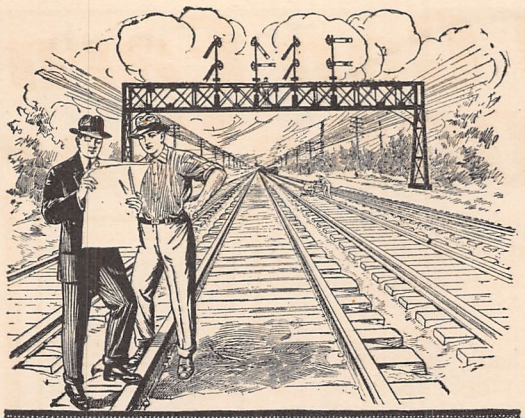

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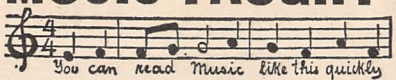

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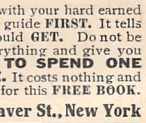

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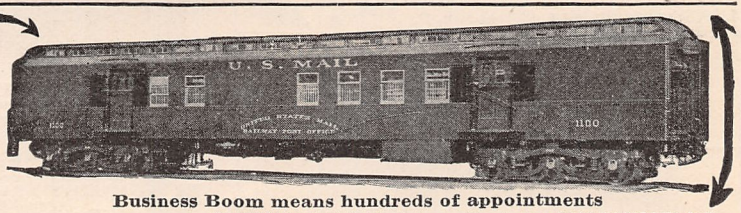

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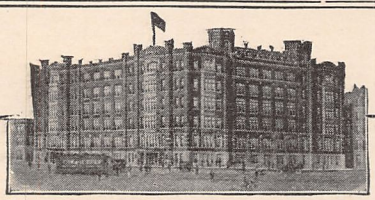

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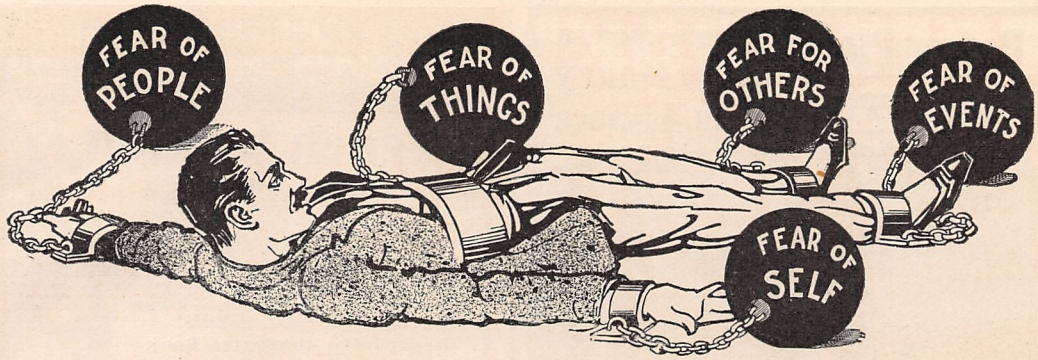

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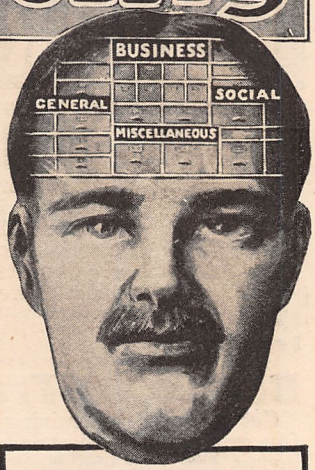

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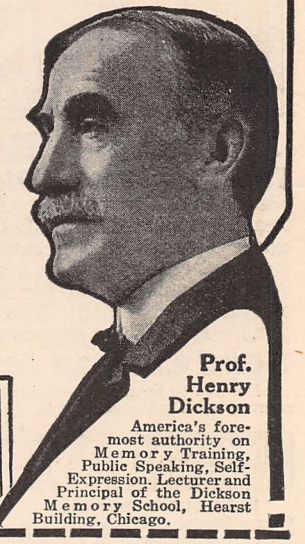

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- ☐ DESIGNER
- ☐ BOOKKEEPER
- ☐ Stenographer and Typist
- ☐ Cert. Public Accountant
- ☐ Railway Accountant
- ☐ Commercial Law
- ☐ GOOD ENGLISH
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Name _____

Occupation & Employer _____

Street and No. _____

City _____ State _____

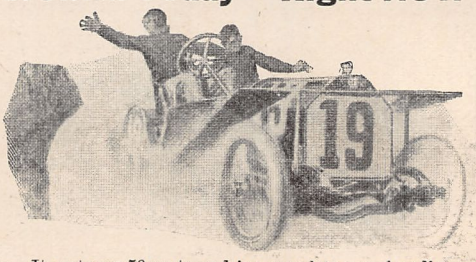
Please Mention Popular Mechanics

MEN WANTED

To Drive and Repair Automobiles and Tractors

Tear Off and Mail the Coupon Herewith Today—Right NOW

It may mean to you all the difference between success and failure. Will you, by training yourself in a few short weeks, become a competent, expert automobile man? **Cash in on your time.** How would you like to have an earning capacity of $5 a day and up? How would you like to have a trade that will always insure you good wages, independence, opportunity to see the world? How would you like to be in demand? Have employers looking for you—have big opportunities for a successful career spread out before you? Now young man, you can't do this simply by wishing. But you can do it



By the Sweeney System
You Can Learn in Six Weeks

There's only one place in the world to learn by the Sweeney System; and that is at the School of practical experience where you learn without text books and by doing the work with your own hands; and that's the Sweeney Automobile School of Kansas City, Mo. I want every young man mechanically inclined to send today for my big catalog. It costs me 50 cents, and is a complete encyclopedia on the subject. It is like a moving picture as the 123 actual photographs show men at work in every department, at every job. It explains the wonderful Sweeney System. I will send it free, to those who answer this announcement, together with a special advantageous offer. A $50 Tractor Scholarship Free. Use Coupon Today—**NOW.**

FREE COUPON

E. J. SWEENEY, President
SWEENEY AUTO SCHOOL
1163 E. 15th St., KANSAS CITY, MO.

Send free tractor scholarship offer and catalog. Also magazine.

Name .....

Address .....

.....

Earn Big Money in the Automobile Business

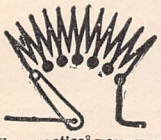
The Sweeney School can give you the names and addresses of over 3,000 graduates who are **now** chauffeurs, repair men, factory experts, garage owners, salesmen, etc. These men came to us untrained. They got interested by reading our advertising, just as you are reading now. They acted on the same impulse that moves you now to investigate. And then after a few weeks' instruction they went out of this school completely equipped, got employment, and today are **Prosperous, Happy and Respected.** You can do likewise. I will teach you so that you have a chance to qualify yourself for a **Business Success** handling or repairing automobiles. It will **cost you nothing** to investigate, and let me tell you the actual experiences of my graduates.

Make $5 Per Day and Up 21,000 tractors were sold this year. Over 700,000 automobiles. Who's going to drive and repair them? Men are in big demand. Our school is doing **double** the business it did last year. Nothing succeeds like success. Don't you want to make $5 a day and up? There's money in the automobile business for you.

E. J. SWEENEY **SWEENEY AUTOMOBILE SCHOOL**
1163 E. 15th Street, KANSAS CITY, MO.

ELECTRICAL men with training are always in demand. Having trained over 2000 young men in the past 23 years in the fundamentals of Applied Electricity, **The Giiss Electrical School,** with its well-equipped shops and laboratories, is peculiarly well qualified to give a **condensed course in Electrical**

ENGINEERING

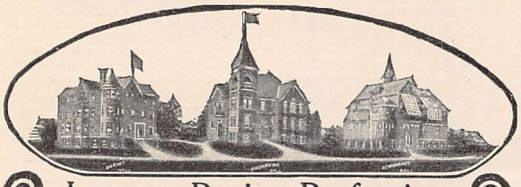


including Mathematics, Steam and Gas Engines, Mechanical Drawing, Shop Work, and Theoretical and Practical Electricity, in all branches. Students actually construct dynamos, install wiring and test efficiency of electrical machinery. Course, with diploma, complete

IN ONE YEAR

For practical young men with limited time. 24th year opens Sept. 27th. Catalogue on request. 104 Takoma Ave., Washington, D. C.

Learn Watchwork, Jewelrywork and Engraving. A fine trade commanding a good salary, and your services are always in demand. Address HOROLOGICAL, Dept. P, Bradley Institute, Peoria, Ill., for our latest catalog.



Learn a Paying Profession

that assures you a good income and position for life. For twenty years we have successfully taught

PHOTOGRAPHY

Photo-Engraving and Three-Color Work

Our graduates earn $20 to $50 a week. We assist them to secure these positions. Learn how you can become successful. Terms easy—living inexpensive. Write for catalogue—NOW!

ILLINOIS COLLEGE OF PHOTOGRAPHY, 999 Wabash Avenue, Effingham, Ill.

ESTAB. 1892

BODEE TRADE SCHOOL

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Our valuable book "P" tells how. It's Free—write for it. Anyone from 16 to 60 years old can easily learn Mechanical Dentistry. The Demand is like a gold mine, Unexplored. We constantly have calls for good salaried positions. Why not qualify for one? No book study. All practical work. We guarantee that you can earn while learning. Installment Payments. Licensed by Regents of N. Y. State.

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Morse and Wireless—R. R. Accounting (Station Agency) taught. Splendid opportunities. Positions secured. Marconi Co. takes our wireless graduates. We own and exclusively occupy two large modern buildings equipped with R. R. and Western Union wires and complete $3,000 Marconi Wireless Station. Largest School—established 40 years. Investment $25,000. **Endorsed by Railroad, Marconi and Western Union Officials. Expert practical teachers.** Low living expenses; easily earned if desired. Tuition low. Easy payments. Correspondence courses also. Catalogs **Free.**

Dodge's Telegraph, Ry. & Wireless Institute
8th Street, Valparaiso, Ind.

BE A DETECTIVE

Earn from **$150.00** to **$300.00** per month; travel over the world. Write

C. T. LUDWIG, 133 Westover Bldg., Kansas City, Mo.

The University of Chicago

HOME STUDY

24th Year

in addition to resident work, offers also instruction by correspondence.

For detailed information address

U. of C. (Div. 20) Chicago, Ill.

Mitchell Tower

Ambition -take a Lesson from Life

The great growth of the departments of the Government; the extension of Commerce; the vast increase of business; the endless multiplication of firms, associations, corporations, combines and trusts have created new opportunities for THOUSANDS of lawyers. In the United States there are NOT NEARLY ENOUGH GOOD lawyers to fill requirements. Thus the opportunities for legally trained men are greater than ever before—the FEES paid to lawyers are LARGER than ever before—and it is far EASIER to start a law practice TODAY than ever before. Therefore, NOW is the time for YOU to begin the study of law.

LAW TRAINED MEN

Earn $3,000 to $10,000 a Year

It is NOT very difficult, after all. Don't be discouraged because you think it is necessary to memorize a great MASS of technical detail—for it is NOT. ALL the technical detail of the law is contained in the LIBRARY we furnish you. We teach you the PRINCIPLES of the law and JUST HOW to APPLY them. Becoming a lawyer is PRINCIPALLY learning HOW TO APPLY the law—HOW to SELL the knowledge contained in the LAW BOOKS. By the LaSalle system of "cross-reference" the principles of the law are easily found—and by the "case" system their application is soon learned. Under our guidance you will obtain this training—the ONLY difference between yourself and a successful lawyer earning from $5,000 to $20,000 a year. The law is powerful. In a comparatively short time it will qualify you to advance from low salary and position into good income and high station. It will make you a MAN among men. If you are in earnest—if you have average intelligence—if you will make proper effort—failure is IMPOSSIBLE.

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It is a fact that the study of law has brought wealth, fame and position to MORE men than any other profession. The majority of our most successful BUSINESS MEN have a fair knowledge of the principles of law. Nearly ALL of our GREATEST STATESMEN have had legal training. United States presidents, cabinet officers, congressmen, representatives, ambassadors, politicians, officials of our states and great cities are NEARLY ALL men of legal training. Many of these men were born in POVERTY AND OBSCURITY and were RAISED into positions of POWER by the law. DETERMINE to do your best. RESOLVE to follow in the footsteps of these great men. The LaSalle Extension University's Great Home-Study Course in Law will make the path EASY for YOU.

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Don't "put off" this matter. Send the Coupon today for the Free Booklets and full information concerning this special law course. Don't allow lack of money to interfere— WE WILL MAKE TERMS TO SUIT YOUR PURSE. Remember that the LaSalle is the largest Home-Study Extension Law School in America—enrolls MORE students than any other. There is a reason. Send the coupon and learn WHY. No "extras" to buy—we supply everything—including the LaSalle Standard Law Library IF YOU ENROLL NOW.

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at your home by the simplified LaSalle System of Law Instruction. You keep your present position and learn while you earn. We have adapted the instruction methods of the leading resident law colleges to correspondence work. Everything is so fully explained—and in such a clear and simple manner—that you cannot help but understand. The LaSalle method takes all the "hard work" out of reading the law—it will save you many months of laborious study. It not only teaches you law, but also how to PRACTICE law.

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Many of our students are business men who recognize the necessity of legal knowledge. Write now for facts about business men's course.

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Our training by mail, will positively teach you the fine art of persuasive speech. Every lawyer—every successful man—should be a forceful speaker. Our course is highly indorsed as most complete and authoritative—prepared by Frederick B. Robinson, A. B., A. M., Ph. D., Professor Public Speaking at College of City of New York, formerly Editor Public Speaking Review. Write and learn how you can NOW secure this valuable course, absolutely free, if you become one of our law students.

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Without obligation on my part, send me, by return mail, information concerning your Course in Law with the free books: "Evidence" and Valuable Law Guide—also concerning your offer of FREE Course in Public Speaking.

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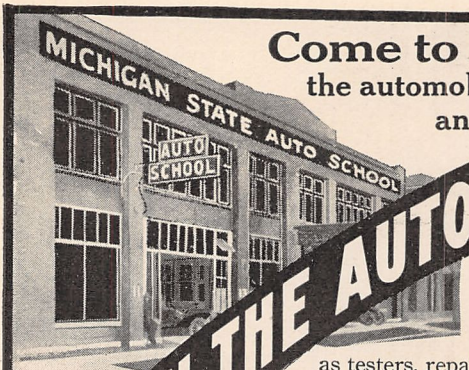
Please Mention Popular Mechanics



Come to Detroit
the automobile center and LEARN THE AUTOMOBILE BUSINESS

Detroit trained men get preference over all others and get jobs quickly. No other city, no other school can give you what Detroit offers. Think what it means to learn in Detroit. Every factory knows us, endorses our school, glad to get our graduates, offers them best territory in which to sell cars and start garages. Unlimited opportunities here. You're right in the middle of the great auto activity. Men are needed everywhere as testers, repairmen, chauffeurs, garage men, and salesmen. Splendid chance to start in business. Hundreds of our graduates are doing it.

Earn $75 to $300 a Month

We teach you to handle any auto proposition. **Our equipment is complete.** Students actually build cars from start to finish, getting regular factory training in assembling, block-testing, road testing, everything. **That's the Detroit way.** Special complete course in **Oxy-Acetylene brazing and welding,** separate from regular course. All leading types of starting, lighting, and ignition systems in operation. Learn to time motors, adjust carburetors, magnetos, valves, bearings quickly and accurately. **Six-cylinder Lozier** and **8-cylinder King** are used for road instruction. We have a new Chalmers "6" chassis with overhead camshaft motor, the latest thing out. Just added 1916 Delco System as used in Buick, Hudson and Packard Twin "6."

Detroit is the Place to Learn—Start Any Time

There are 44 auto factories in Detroit, and hundreds of accessory and parts factories. Our students have the privilege of going through any or all of them, including Detroit electric service department, while taking our course. You can't get these advantages anywhere else. **Detroit is the automobile center.** You make faster time here and you get **practical instruction.** Come to Detroit and learn the business right. Enter classes any time, any day. Three classes daily, morning, afternoon and evening. You can work in the factory in day time and take course at night. There is a great demand for Detroit trained men. Garages throughout the country write us for men. Auto factories write and phone for men constantly to fill permanent places. Why not **fit yourself** for one of these **good paying** positions?

The demand is greater than the supply for competent trained men. The following were clipped from daily papers in all parts of the U. S.

Wanted—Experienced motor mechanics, bearing scrapers, assemblers, repairmen; good wages. Henderson Motorcycle Co., 1158 Cass.

Wanted—Chauffeur, must be good driver, steady and reliable; one with knowledge of Pierce-Arrow cars preferred; no other but good mechanic need apply. Address Box B. No. 100 Free Press.

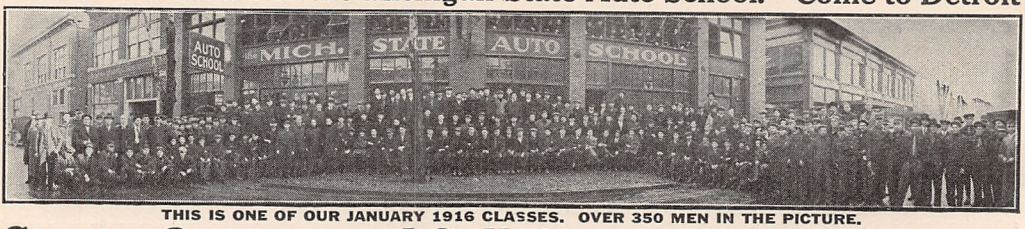
Wanted 10 Road Testers, 20 garage repair men, final assemblers. Maxwell Motor Co., Inc., Oakland Ave. Plant.

Wanted 40 Drivers. Come ready to work. Maxwell Motor Co., Inc., Oakland Ave. Plant.

Wanted Block Testers. Apply Continental Motor Mfg. Co.

Wanted—High grade retail automobile sales manager. Box E. No. 52.

Follow the Crowd to the Michigan State Auto School. Come to Detroit



THIS IS ONE OF OUR JANUARY 1916 CLASSES. OVER 350 MEN IN THE PICTURE.

Start a Garage and Sell Cars—Be Independent

We have made the biggest deal yet. Just completed arrangements with the Automobile factories to put them in touch with men who intend going into business for themselves. Think of getting inside information as to best territory and where the garages will make most money. The auto factories keep close watch—they are looking for Detroit trained men to represent them and start garages. Men who **know** the Auto business from A to Z are in biggest demand. **Come here and start right**—go through the factory. Learn the best selling points—get the information first handed and dont wait, jump on a train and come now.

We have made arrangements with a large eastern investment firm (with millions of dollars), to back competent, reliable, Michigan State Auto School Graduates, who want to go into the garage and selling business. **These Capitalists know where the money is to be made**—they are ready to back the right kind of men—Men who are trained at the Michigan State Auto School and are competent. Have you been waiting for such an opportunity? Then **come to Detroit** as hundreds of men have done, **hurry,** don't wait. You can complete the course in from six to eight weeks. Then go into business for yourself. BE INDEPENDENT. Make the big money. Get started NOW.

Money-Back Guarantee

We guarantee to qualify you in a short time for a position as chauffeur, repairman, tester, salesman, demonstrator, garage man, or automobile dealer, paying from $75.00 to $300.00 monthly or refund your money. We have constantly more requests for Detroit trained men at GOOD salaries than we can supply.

SEND THIS COUPON TODAY

Michigan State Auto School
Dept. 305, 11-19 Selden Ave., Detroit, Mich.

Gentlemen: Send to me absolutely FREE "Auto School News" and New Catalog or better still you can expect me about.....

Name.....

Street.....

Town.....State.....

Automobile Industry Offers Biggest Possibilities

No other field is so big—no other business so permanent. Every place, no matter how small, will support a garage. Think of it—nearly a million new automobiles will be sold this year. Think of the money in selling and repairing. **Are you going to reap some of the golden harvest?**

Act Quickly—NOW

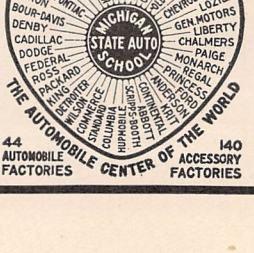
Fill in the coupon and mail it now, get full particulars—get "Auto School News" and New Catalogue fresh from the press. They are both ABSOLUTELY FREE. Or better still, jump on a train, as hundreds have done, and come to Detroit, the "Heart of the Automobile Industry" and learn right. Remember, you can enter classes any time any day. Act quickly, **NOW.**

Michigan State Auto School

The Old Reliable School

Dept. 305, 11-19 Selden Ave., Detroit, Mich., U. S. A.

DETROIT
THE HEART OF THE AUTO INDUSTRY



44 AUTOMOBILE FACTORIES

140 ACCESSORY FACTORIES

Sailors in Winter Camp at Guantanamo, Cuba

WINTER DRILLS IN THE NAVY

DURING the winter months, the U. S. Atlantic Fleet proceeds to Guantanamo Bay, on the South Coast of Cuba, where are conducted the various ship and fleet drills and maneuvers.

The sailors go into camp overlooking the bay, affording plenty of fresh sea breezes at all times. While ashore in divisions the men practice with small arms on the Rifle Range, the largest in the world. They participate in numerous shore drills, such as scaling walls, landing an armed force, artillery maneuvers, etc. Camp life is a pleasant diversion from the routine on shipboard, and adds to the interesting features of the Naval service.

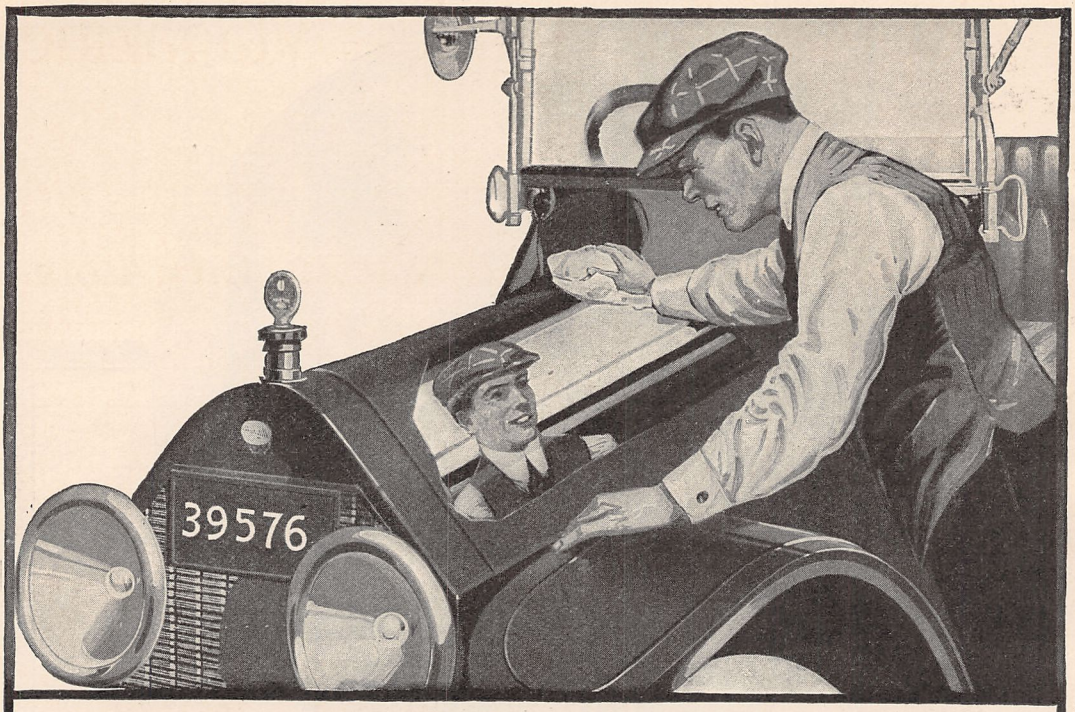
While the fleet is at Guantanamo, athletics of all kinds are encouraged, especially base ball, boxing and boat races. It is at Guantanamo that the annual cup races of the Fleet are held, and the many handsome Navy trophies contested for. Moving pictures are shown nightly, and minstrel shows are of frequent occurrence.

The men return North in the Spring, bronzed and in prime health from their winter spent in the tropics. Upon arrival in home ports, the sailors are granted furloughs to visit their homes.

THE NAVY offers an attractive career to young men of good habits. If you are an American citizen over 17 and under 30, it will pay you to investigate the Navy's opportunities. Call at the nearest Navy recruiting station, and talk it over. Costs nothing to be examined.

If there's no recruiting station in your vicinity, write to Box 70

Bureau of Navigation NAVY DEPARTMENT WASHINGTON, D. C.



A Dust-Proof Polish

on your car minimizes the work of cleaning. With but very little effort you can keep the finish of your car like new—all you need is Johnson's Cleaner and Prepared Wax.

JOHNSON'S CLEANER

really cleans—it entirely removes all stains, discolorations, scum, road oil, tar and grease from body, hood and fenders. Even those spots that are ground in—mud freckles—and surface scratches you thought were permanent—will disappear like magic under Johnson's Cleaner. And it doesn't injure or scratch the varnish—simply cleans and prepares it for the wax polish.

JOHNSON'S PREPARED WAX

is the proper polish to use on your car. It preserves the varnish and protects it from the weather, adding years to its life. It covers up mars and scratches—prevents checking—and "sheds water like a duck's back."

Makes a "Wash" Last for Weeks

Mud and dust do not stick to Johnson's Prepared Wax. After a dirty, dusty trip, just wipe off your car—it isn't necessary to wash it. Many people even wax the **under side** of their fenders because the mud comes off so easily.

Old Cars require both Cleaner and Wax—the Cleaner two or three times a year—and the Wax every six or eight weeks. **New cars** need only the Wax—to protect the varnish. This will keep your car like new indefinitely.

USE COUPON FOR TRIAL CANS

S. C. JOHNSON & SON, Racine, Wis. PA5

I enclose 10c for a trial can each of Johnson's Cleaner and Johnson's Prepared Wax—sufficient for cleaning and polishing a large car.

Name.....

Address.....

City and State.....

My Accessory Dealer is.....

Popular Mechanics Magazine

REGISTERED IN U. S. PATENT OFFICE

WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 25 MAY, 1916 No. 5

Using Periscope to Sell Vacant City Lots

AT Los Angeles a real-estate dealer has devised an original and unusually interesting method of showing lots in a subdivision near his office to prospective purchasers. Instead of being taken to the tract itself, interested persons are first ushered into an octagonal room which constitutes the second floor of the agent's building. This is about 10 feet in diameter, windowless, and finished with black walls. In the middle of the room is a circular table covered with white oilcloth, while immediately above it at the peak of the cone-shaped roof is a turret with an opening on one side through which the property is clearly visible. Mirrors are arranged to catch the light rays admitted through the aperture

The Image is Reflected upon the Glazed Table Top, Thus Affording Not Merely a Novel but a Minutely Accurate, Detailed Map of the Subdivision

and reflect them upon the table so that the image of the tract is sharply shown upon the white surface. With the aid of a pointer he indicates different lots just as if a large map were being used. The novelty of the arrangement causes his spectators to give close attention to the lots in question. Property offered by rival firms is in this way also kept entirely out of a "prospect's" view until the agent has him well in hand for a deal.

HOME COMFORTS IN MOTOR-CAR CAMPING OUTFIT

What is one of the most elaborate and at the same time most compact camping outfits designed as an adjunct to an automobile consists of a telescopic attachment which can be quickly fastened to or detached from any roadster. This outfit includes comfortable sleeping accommodations for two, a sheltered shower-bath compartment which can be warmed and supplied with warm water, a complete kitchen equipment, including a two-burner gasoline stove, a chest containing three commodious drawers, special storage for two suitcases, a camp table and two camp chairs, six incandescent lights supplied by a battery, and other conveniences.

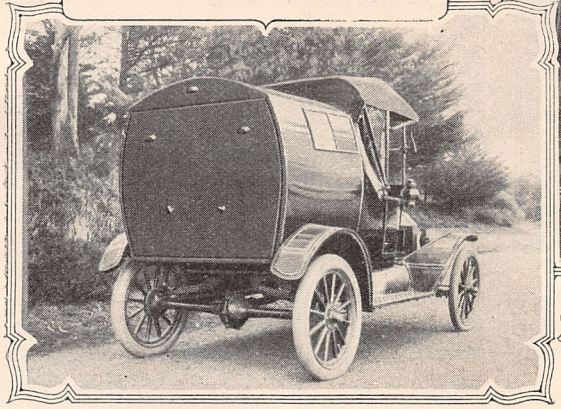
The entire outfit is inclosed in a steel cylindrical case, and when closed measures 3 ft. 4 in. long, 4 ft. 4 in. wide, and 3 ft. 8 in. high. At the rear is a door hinged at its lower edge. By letting this door down and resting its outward end on two adjustable legs, the bed, a portion of which folds up against the door when the latter is closed, is laid out flat. When the compartment has been opened in this manner, two chests or cases are revealed occupying part of the space above the bed. By drawing these toward the

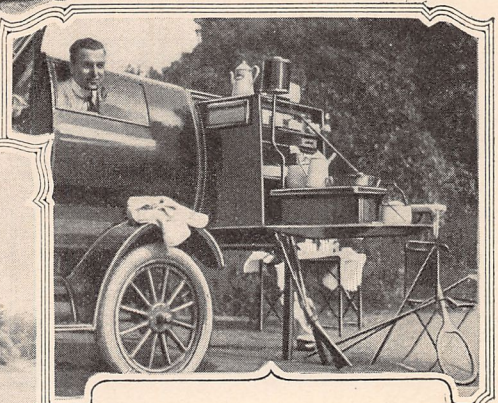
The Camping Outfit in Use, with the Shower-Bath Shelter, or Dressing Room, Set Up at the Rear of the Berth. Lower View: An Inviting Bookshelf is Located over the Head of Bed

Ample Drawers for Clothing and Room for Toilet Articles and a Suitcase

The Shower Bath is Supplied with Water Warmed by the Engine Which Flows by Gravity from the Tank under the Roof

"All the Conveniences of Home": The Collapsible Automobile Camping Outfit Showing the Berth Made Up, the Chest of Drawers, the Kitchen Equipment, and the Dining Arrangement. Below: The Camping Outfit Closed





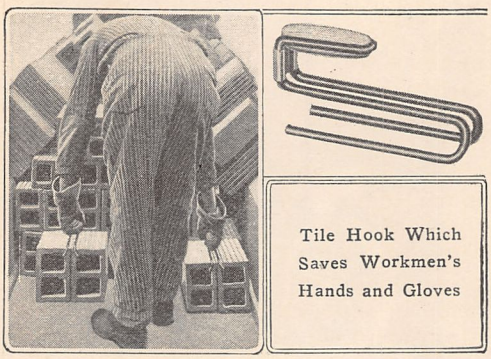
At Each Side of the Head of the Bed Is a Window That Furnishes Ventilation in Addition to the Window in the Rear

rear their full length, together with a telescoping roof, they are then in a position from which they can be pushed to the right and left, respectively, thus leaving the bed unobstructed. If preferred, the roof need not be drawn out over the bed. A hinged shield can be let down at the end of the extended roof and sides, thereby completely inclosing the berth. Two windows with sliding blinds are situated, one at either side, at the forward end of the compartment.

By opening the door of one of the chests an arrangement of utensils similar to that in a kitchen cabinet is displayed. The door can be used as a shelf on which to set the gasoline stove, etc. The other chest has a hinged shelf that can be used as a writing desk, and contains three drawers for clothing. In the top of each chest is space for a suitcase. An optional supplementary feature is a 10-gal. tank which can be connected with the engine's radiator for heating water; it is located just under the roof. A tentlike shelter with a metal roof, having a suitably connected shower-bath spray, can be set up at the rear of the car adjoining the berth and can be used either as a bathroom or as a dressing room. This shelter can be heated by air warmed by the engine. The inventor claims that the outfit can be used to advantage as an emergency hospital.

HOOK LESSENS LABOR OF HANDLING TILE

A simple hook has been designed recently which lessens the labor of handling tile and prevents the rapid wearing out of workmen's gloves and the bruising of their hands. It consists essentially of an iron rod bent double and then bent again to somewhat resemble an angular "S." The lower portion of the "S" consists of two parallel prongs by means of which two tiles can be lifted at a time. The upper end of the "S" has been made into a handle by inserting between the

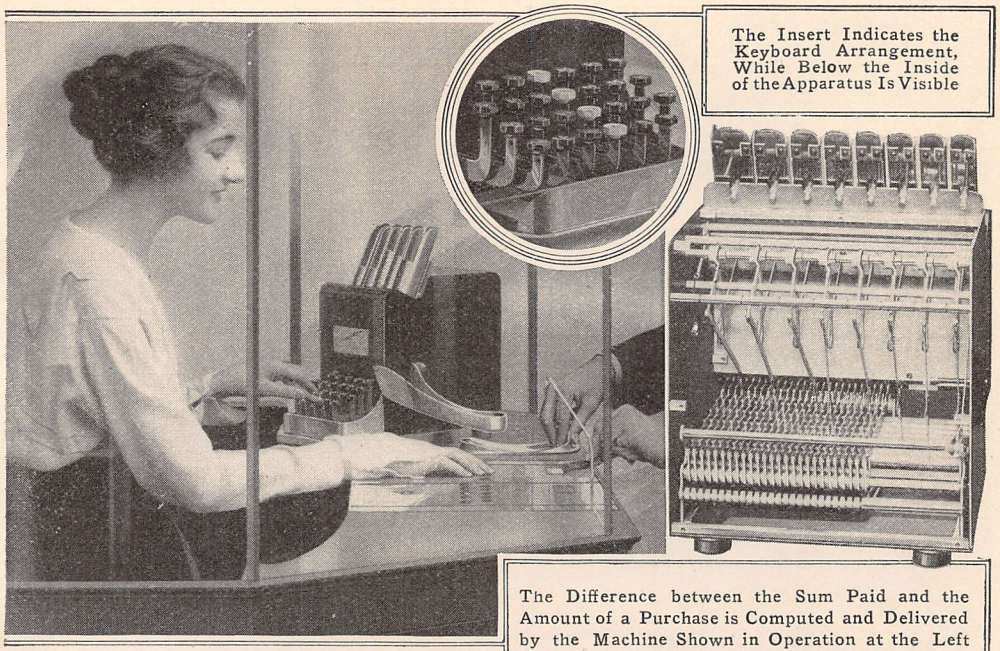


Tile Hook Which Saves Workmen's Hands and Gloves

parallel portions of the iron bar a rounded piece of wood. With this tool tiles can be lifted and deposited quickly.

CHANGE-MAKING APPARATUS WORKS WITH RAPIDITY

In business places where patrons come in contact with a cashier, time is saved and the chances of errors lessened by the use of a mechanical money-changing device of recent development. It determines and delivers the difference between the sum paid and the purchase amount and requires but little mental exertion of its operator. The apparatus works accurately and at high speed, facilitating the handling of crowds at city elevated and subway-transportation stations, cafeterias, and similar places. A somewhat different model of the same machine is especially designed for banks and large offices for payroll and other work. The former type has 26 numbered keys arranged like those of a typewriter and is set to make change from one dollar. By pressing certain readjusting keys, however, it will make change from smaller denominations, such as 75, 50, or 25 cents. In operating it the cashier presses a key corresponding to the amount of the purchase. The machine then does the rest, delivering the proper amount of change into a saucer-shaped receptacle from which the patron removes it, or into a money pocket from where it is taken by the operator. The



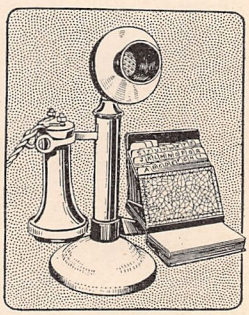
The Insert Indicates the Keyboard Arrangement, While Below the Inside of the Apparatus Is Visible

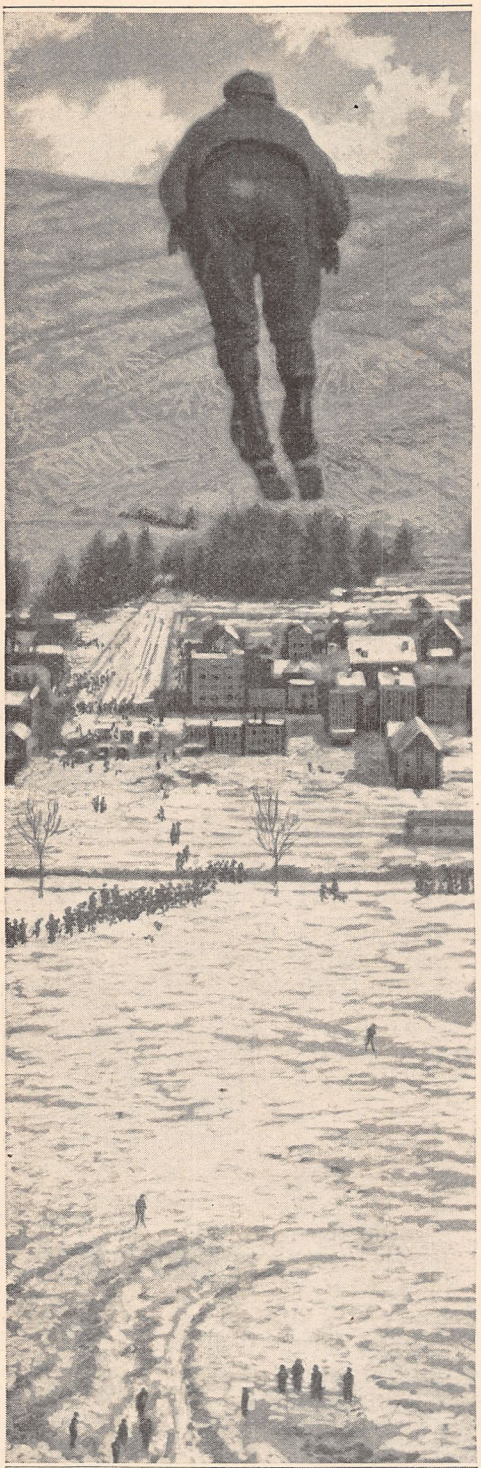
The Difference between the Sum Paid and the Amount of a Purchase is Computed and Delivered by the Machine Shown in Operation at the Left

apparatus is smaller than the average adding machine and is housed in a neat metal case. On top at the back it supports a coin tray, while at the front, in the same relative position as that of a typewriter, is its keyboard. Nineteen of the keys represent amounts from 5 to 95 cents in multiples of five. If one dollar is handed a cashier in payment for a 10-cent purchase, the "10" key is pressed and 90 cents delivered. If, on the other hand, 50 cents were given instead of a dollar, the operator would press a red key marked "50"—adjusting the machine to make change from a half dollar—and then use the "10" key, causing the delivery of 40 cents. A similar procedure is followed when change is to be made from other sums. In the middle of the keyboard there is a series of white keys which control the penny stacks in the coin tray. They pay out from one to four cents, according to the numbers they bear, and are employed when the amounts of purchases end in sums not multiples of five. The second model instead of making a deduction from a larger amount delivers change in sums corresponding to the amounts indicated on the various keys. If 65 cents is wanted, for instance, the key so marked is used.

NAMES QUICKLY FOUND IN FILE FOR PHONE LIST

A new device for making the names and numbers of a "live" telephone list instantly available consists of a case, or rack, containing a number of cards set on edge. A proper number of the cards are supplied with alphabetical index guides on their upper edges. All the cards are so fastened that they can be sufficiently separated at the top to allow the user to see at a glance any desired card. A spring closes the file when not in use. Immediately in front of the cards is a convenient memorandum pad. The device can be fastened to a telephone instrument or allowed to stand on a desk.





Making the Winning Ski Jump of 192.9 Feet and Breaking All Existing Records

NEW WORLD RECORD IS MADE BY AMERICAN SKI JUMPER

During a skiing contest recently conducted at Steamboat Springs, Cal., Ragnar Omtvedt, an American, captured the world's championship honors by establishing a new record. Before a large crowd of enthusiasts he succeeded in making a jump of 192.9 ft., breaking the existing record, which was held by Amble Omundsen of Christiana, by 15 ft. The man has been a prominent professional for several years and taken a number of titles. He belongs to a Chicago ski club and held the previous American record of 169 ft. At the national tournament of the American Ski Association in 1914 he took first place with jumps of 153 and 161 ft. and a total of 340 points. It is understood that the new record is official and will stand.

NO WAY IS FOUND TO CHECK CHESTNUT BLIGHT

Forest pathologists of the Department of Agriculture have been unable to find any practical way of controlling the bark disease which during the past 12 years has spread into 19 states and done approximately $50,000,000 damage to chestnut trees. The blight now affects all of the northern half of the country's native groves and gives no indication of abatement. Extended investigations have shown, however, that Asiatic species of the tree have for centuries manifested great resistance to the disease. From this it appears that the best way of coping with the present serious situation lies in substitution, and in breeding by hybridization for the production of new varieties especially suited for our needs. Already hybrids between the Japanese and native chinquapin have been developed. These have formed into quick-growing dwarf trees bearing heavy crops of excellent nuts at an early age. The trees have also shown high resistance to disease. Intercrossing of Japanese and Chinese varieties is also resulting favorably.

GERMANY'S RAILWAY PROBLEMS IN ASIATIC TURKEY

By R. J. BJURSTEDT

GERMANY'S plans for the commercial exploitation of Asiatic Turkey date back thirty years, but her active campaign to bring about a practical realization of these ambitions has not occupied much more than the last decade. Things were rushed during that decade, however, and in scarcely any of the "places in the sun" over which the German flag actually floated had more headway toward complete Teutonification been made than in Asia Minor, Syria, and Mesopotamia. The main factor in winning commercial, if not political, control of this incalculably rich region was to be a comprehensive railway system, gridironing the agricultural sections and linking up the principal strategic points with modern trunks capable of transporting powerful military forces wherever they were most needed for offense or defense.

In 1912, at Aleppo, a German engineer traced for the writer 7,776 miles of railway upon the map of Asiatic Turkey, stating that this represented the preliminary scheme of development. "The completion of these lines," he said, "will make it possible, first, to bring the products of Asiatic Turkey's principal agricultural and mineral regions to market, and, second, for the Turks to put up a stiff defense against their principal enemy, Russia, on the north, or against any threat to Mesopotamia from the east or south, or to Palestine from the south and west." Nothing was said about offense; but Meissner Pasha, chief engineer of the Bagdad and Hedjaz railways, practically admitted to the writer that "strategic considerations" were not lost sight of in running the survey of the former line hundreds of miles away from the direct route between Aleppo and Bagdad, so as to flank Armenia on the south and Persia on the west, and that a potent factor in determining the Turks to have the northern end of the Hedjaz Railway built through the desert south of Damascus instead of the more fertile coastal region, was to make it safe from naval attack in the event operations were being carried on against Egypt from Palestine.

But however well prepared Germany was for the great struggle in Europe, in Asia the crisis was precipitated several years before she was ready for it. Feverishly as she had been working in the three or four years immediately preceding the war, August, 1914, found her with only something like one-third of the great 7,800-mile railway system she had projected for the development of the 800,000 square miles of Asiatic Turkey completed, and, worse still, not even were the two great military trunks which were to have formed the backbone of defense finished throughout all of their respective lengths. As a consequence there have been two kinds of battles waged beyond the end of the Mediterranean—one of the Turks against their enemies, in an endeavor to drive back the invading Russians and Britons, and the other of the Germans against the forces of nature in an endeavor to provide their ally with adequate transportation facilities. Neither Turk nor German has come anywhere near a sweeping success in their respective endeavors so far. With whomever ultimate victory rests, however, enough is known of what the Germans, in the face of apparently prohibitive odds, have accomplished in railway construction to make their achievements historic from an engineering standpoint, if from no other.

Since the whole of Asiatic Turkey lying beyond the longitude of the eastern end of the Mediterranean is barely able to feed its scanty population in normal times, and has no manufacturing facilities whatever, it will readily be understood why, with the sea closed to the central allies, a first-class railway system would be almost a *sine qua non* to extended military operations in this region. Such a line there was from Scutari, opposite Constantinople on the Bosporus, to the Taurus Moun-

tains, while in Syria and Palestine there were also modern railways, and even the beginnings of one—the Bagdad—in Mesopotamia. But between the systems of Asia Minor and those of the rest of Asiatic Turkey, there was, when the war started, not only the break of twenty or thirty miles of heavy rock work in the Taurus, but a similar stretch of almost equally difficult construction in the Amanus Range, which forms the ultimate barrier between Asia Minor and Syria.

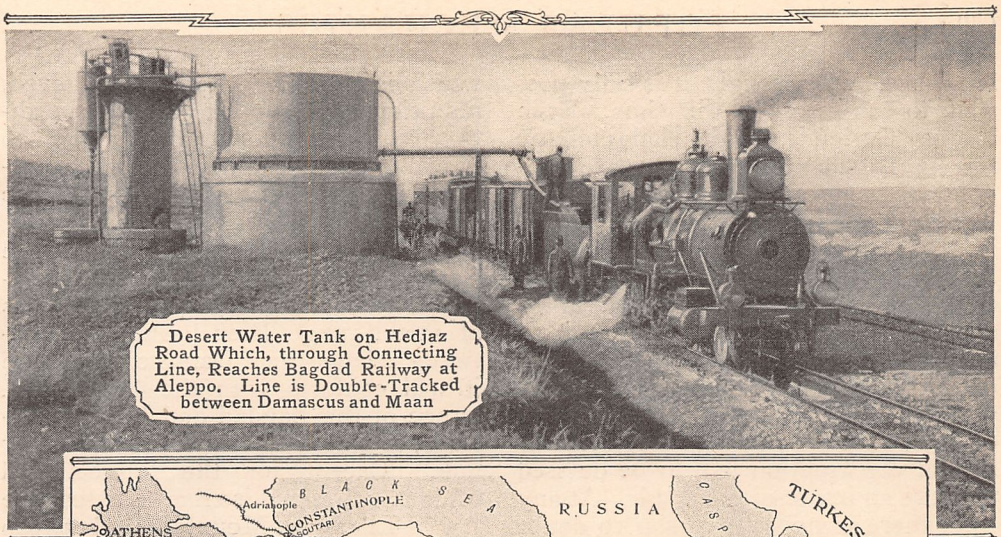
When the writer traversed the Amanus and Taurus passes in 1912 by caravan the German engineers in charge of construction expressed themselves as "hopeful" of finishing the last tunnels by the middle of 1917, in time to open up through service between the Bosporus and Bagdad by the fall of that year, when the "golden spike" of the great trans-Mesopotamian line was expected to be driven somewhere along the Tigris. My own impression then was that this hope was too sanguine.

When Turkey came into the war in October, 1914, the difficulties in the way of construction in the Taurus and the Amanus were greatly increased by the closing of the sea routes, so that what had hitherto been the main line of supply—the steamer service to the Gulf of Alexandretta—was no longer available. With rail communication between the Bosporus and Germany already severed in the Balkans, the German engineers toiling to throw the "Turkish life line" across the Taurus and Amanus mountains were left very much "on their own." In the countries of the entente group, as the writer had good opportunity to observe, the general impression was that railway work in all parts of Turkey in Asia would be practically brought to a standstill for lack of materials, and in London and Paris the opinion was confidently expressed that the gaps in the two great ranges of Asia Minor could not possibly be closed in the duration of the war.

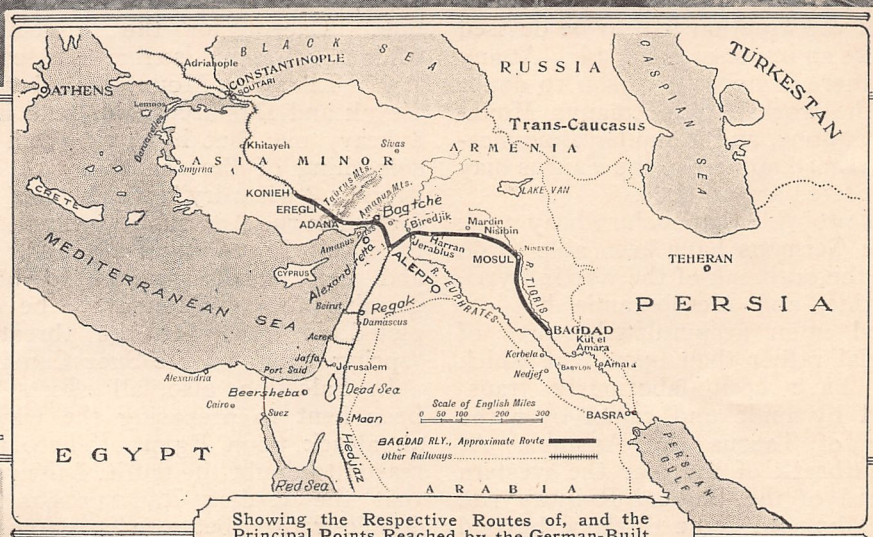
There was little news of railway work in Asia Minor during the first eight months of 1915, and then, like lightning from a clear sky, came the announcement from Constantinople that the three-mile Bagtche tunnel through the backbone of the Amanus ridge had been completed, and that trains were expected to run between Adana and Aleppo by November or December. London openly scoffed at the report, and the writer must confess to having held much the same attitude toward it until, under date of September 3, 1915, he read in the Daily Commerce Reports of the American Consular Service a detailed description of what had been accomplished in the region in question. After telling in a general way how, in spite of the delays occasioned by the war, this most important piece of railway construction in Turkey had passed the problematical stage, the report gives the following specific details, which will leave no doubt in the mind of one familiar with the work in hand that the most important difficulties have been surmounted:

"Leaving Mamoure, the last station of the Bagdad Railway on the Cilician plain, the line begins, at an altitude of 394 ft., to climb the slopes of the Amanus Mountains, which are intercepted by ravines crossed by eight steel bridges and seven small tunnels, the latter having a total length of 6,355 ft. Thus it arrives at Bagtche station, situated at an altitude of 1,754 ft., near the entrance of the great tunnel which bears its name. Before reaching the mouth of this tunnel, the line runs through two other tunnels, having a length of 236 and 394 ft. respectively, and over a small bridge. The great tunnel has a length of 16,028 ft. For about 8,000 feet it ascends to 246 ft. above the level of the entrance, and then begins to descend and emerges at the other end 197 ft. above the level of the eastern entrance. Between this point and Islahie station, which is still building, there are four more tunnels having a combined length of 3,500 ft. The total length of the tunnels necessary to construct in crossing this range of mountains is, therefore, 26,250 feet."

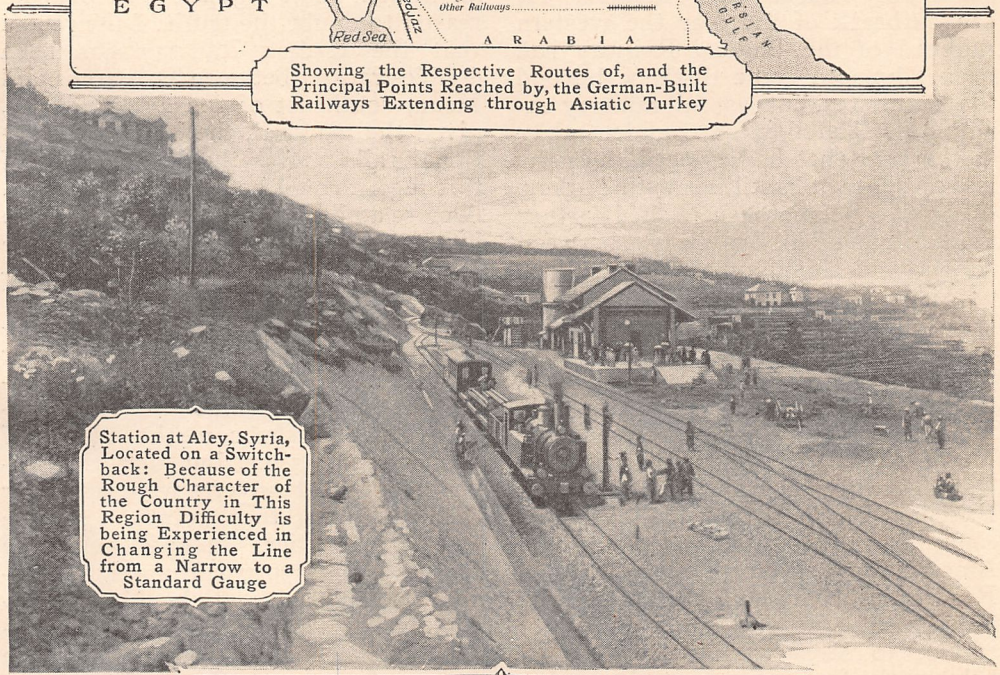
How this miracle—for it is scarcely



Desert Water Tank on Hedjaz Road Which, through Connecting Line, Reaches Bagdad Railway at Aleppo. Line is Double-Tracked between Damascus and Maan



Showing the Respective Routes of, and the Principal Points Reached by, the German-Built Railways Extending through Asiatic Turkey



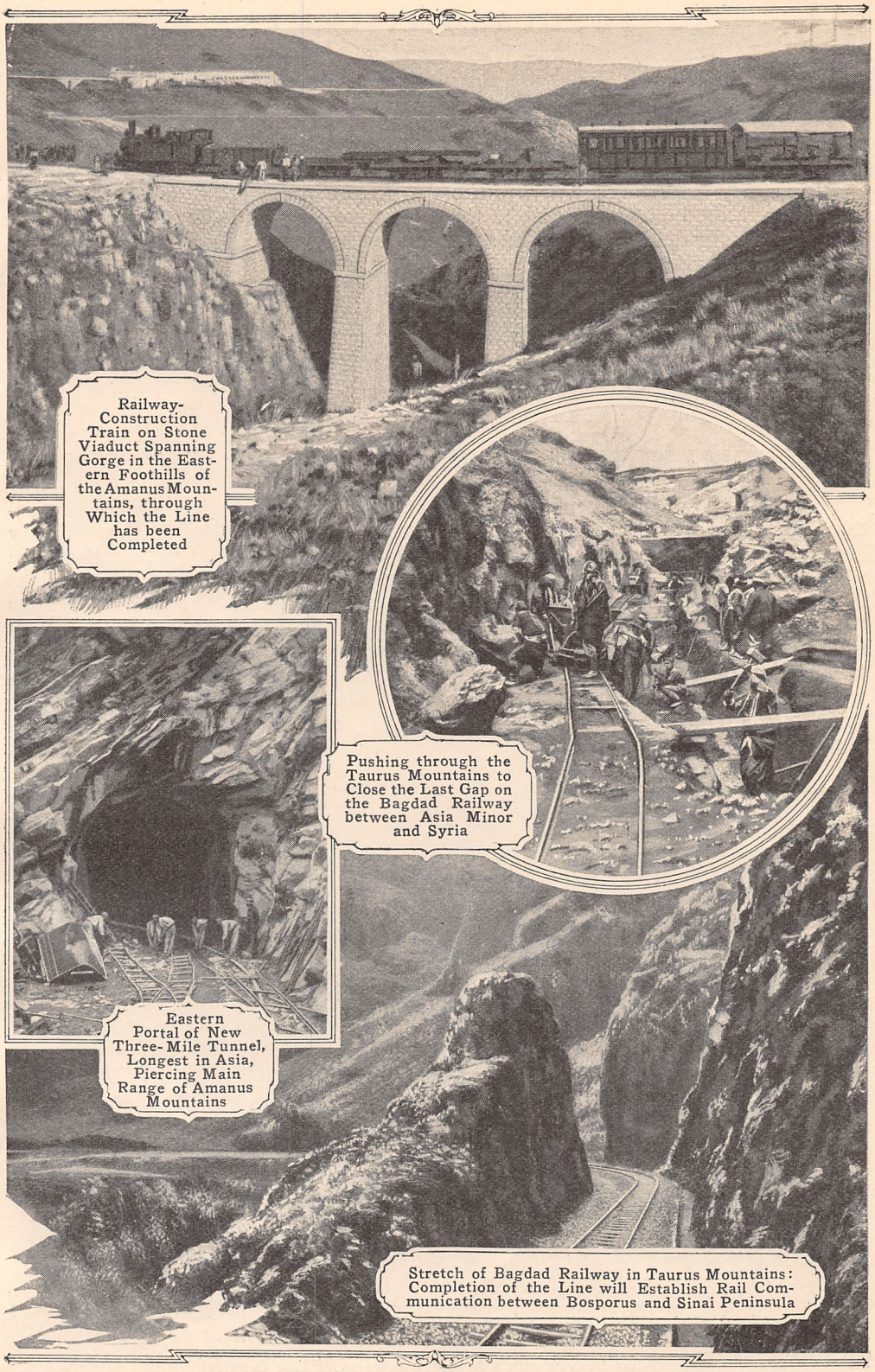
Station at Aley, Syria, Located on a Switch-back: Because of the Rough Character of the Country in This Region Difficulty is being Experienced in Changing the Line from a Narrow to a Standard Gauge

less—has been wrought it is only possible to conjecture at this time. Even if the Germans, with characteristic foresight, had provided adequate supplies of materials in anticipation of being cut off from their main sources, it is still almost beyond understanding how so much tunnel and bridge work could have been accomplished in so short a period, especially since it is authoritatively stated that several hundred yards of pure quartz had to be pierced in the Bagtche bore, and this of so refractory a nature that drills of special construction had to be devised to make an impression upon it. At any rate, there is now no reason to doubt that the work in the Amanus Mountains is done, and a similar announcement regarding that in the Taurus may be expected at any time.

It is probable that such railway work as the Germans have been able to do since the outbreak of the war in Syria, Palestine, and Mesopotamia has depended upon accumulated stores of material rather than upon that which could have been laboriously transported by mule and camel over the passes of Taurus and Amanus. At the outbreak of the war the western railhead of the Bagdad Railway had been advanced some distance beyond the Euphrates, but last fall military experts in London were confident that, in the year that had elapsed since the inauguration of hostilities with Turkey, it could not have been pushed farther than Ras-el-Ain, midway between Aleppo and Mosul, on the Tigris. The unexpected appearance at Bagdad of the overwhelming Turkish forces which defeated General Townshend at the end of last November, however, furnish good base for the belief that the "unbridged" gap between the Mesopotamian railheads is very much less than had been anticipated by the British. There is no possibility, as some so-called military experts in America have held, that the Bagdad Railway is completed throughout its length, but even the establishment of service to Mosul would be of great help to the Turks, as from that point, which is the site of ancient Nineveh, munitions and supplies can be expeditiously rafted down the Tigris to Samara, to which point rails had already been laid from Bagdad when the war started.

In Syria the principal effort of the German engineers will have been directed to broad-gauging the 250 miles of meter-gauge French-built line between Aleppo and Damascus, so that it will conform with the 4-ft. 8½-in. gauge of the Bagdad and Hedjaz railways, of which it forms the connecting link. Except for the tunnels and bridges where this line crosses the Anti Libanus Mountains, between Reyak and Damascus, this task is not a heavy one, but it would seem that something of the same sort of engineering "wizardry" which was performed in the Amanus Range will have to be called into play if the heavy steel and rock work incident to broad-gauging this division is to be completed in time for the threatened "spring drive" on the Suez Canal.

In Palestine, also, all efforts have been bent to preparing the way for an attack upon Egypt. There is no reason to doubt the truth of the report that the Hedjaz Railway has been double-tracked between Damascus and Maan, southeast of the Dead Sea, as, given the material, the laying of additional rails across the level desert of this region could be done very quickly. A more ambitious piece of construction is a line running from E'Futeh, on the Deah-Haifa branch of the Hedjaz Railway, via Lydda and the plain of Sharon to Beersheba, near the southern frontier of Palestine. The writer has unquestioned authority for believing that not only was this line completed to Beersheba in the middle of January, this year, but that the embankments and culverts were ready for the rails from that point on to the Egyptian frontier. Indeed, should the threatened Egyptian campaign actually be launched, and should the British—as it is now probable they will—confine their defense to the immediate region of the Suez Canal, there is no



Railway-Construction Train on Stone Viaduct Spanning Gorge in the Eastern Foothills of the Amanus Mountains, through Which the Line has been Completed

Pushing through the Taurus Mountains to Close the Last Gap on the Bagdad Railway between Asia Minor and Syria

Eastern Portal of New Three-Mile Tunnel, Longest in Asia, Piercing Main Range of Amanus Mountains

Stretch of Bagdad Railway in Taurus Mountains: Completion of the Line will Establish Rail Communication between Bosporus and Sinai Peninsula

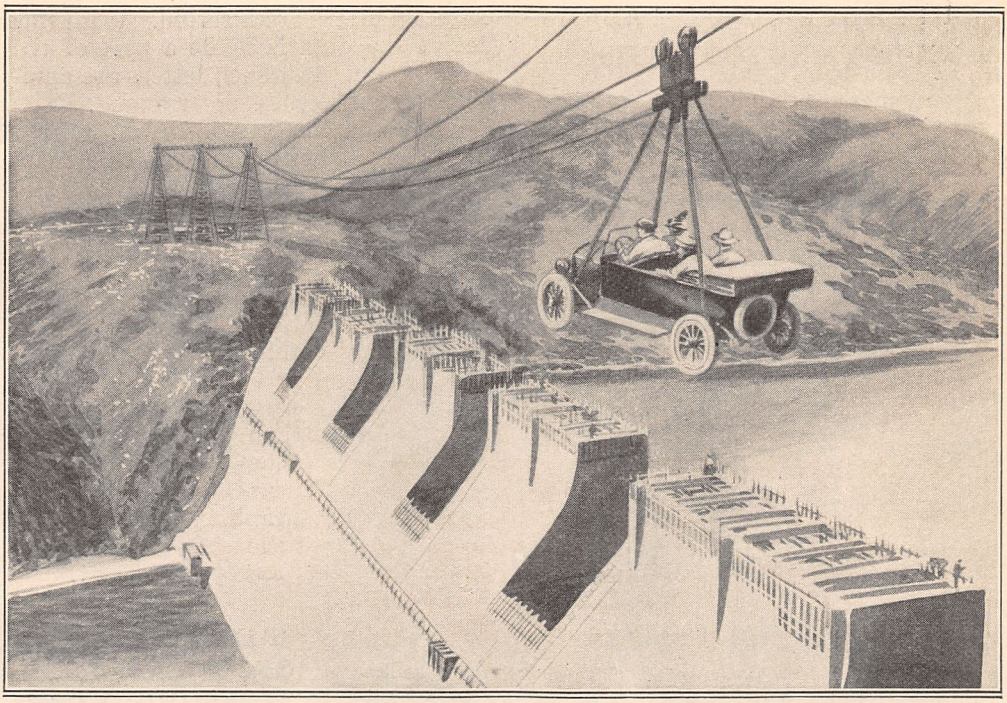
doubt that this line will be pushed some distance across the Sinai peninsula before giving way to portable railways in the rear of the Turkish armies.

Notwithstanding their almost superhuman efforts in Asiatic Turkey, the writer does not believe it possible for the Germans to develop a line of railway communications from the Bosporus to the Sinai peninsula adequate to munition and feed a large enough army—it would have to be close to 500,000 strong to stand any chance of success—seriously to threaten the Suez Canal; and it is by no means unlikely that uncertain communications may make it impossible for the Turks to drive the British out of Mesopotamia or the Russians out of Armenia. In spite of these possibilities, and no matter to which side the military victory goes, no unprejudiced observer can deny that, considering the difficulties with which they have been faced from the outset, the achievements of the German engineers in Asiatic Turkey are worthy to rank with the most remarkable of their kind in history.

WOODEN HOWITZERS USED IN FILM "INVASION"

There have recently been manufactured in this country a number of ponderous howitzers made chiefly of wood; to every outward appearance they are the counterpart of the deadly weapons in Europe, of which comparatively few photographs have been taken, but of which much has been written. These formidable-looking guns were built to be used in the production of a motion-picture presentation of an invasion of this country by an armed force. When they are "fired" a powder is used which gives off a dense smoke that photographs very distinctly. These howitzers and other pieces of artillery, including imitation ammunition carriages, present a very realistic appearance on a field. Uniformed actors operate the guns.

One of a Battery of Ponderous Guns Made Chiefly of Wood, Discharging a Dense Smoke but No Projectiles: These Guns were Manufactured for the Purpose of Producing Motion-Picture Films Dealing with a Supposed Invasion of This Country



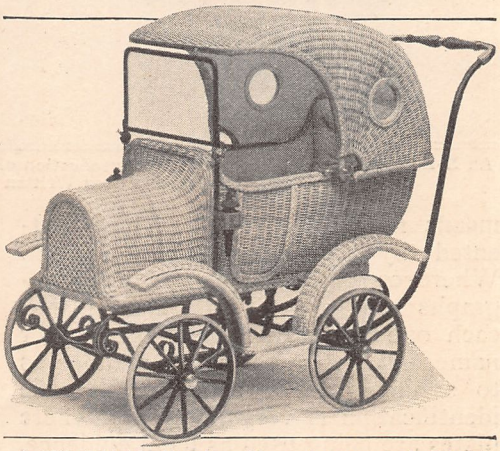
A Party of Four Motorists and Their Car, 255 Feet in the Air, Supported by the Aerial Electric Tramway at the Elephant Butte Dam

AERIAL TRAMWAY CARRIES MOTORISTS HIGH IN AIR

Recently persons in the vicinity of the Elephant Butte dam in New Mexico had the startling experience of seeing a touring car and four passengers transported by cable through the air 255 ft. above the earth. To accomplish this rather thrilling feat the motor car was fastened by strong ropes to a carrier of the aerial electric tramway used in conveying material to the great dam. The crown of the barrier rises 255 ft. above the stream, and the car was carried without mishap along a line level with the top of the dam.

BABY CARRIAGE BUILT LIKE AN AUTOMOBILE

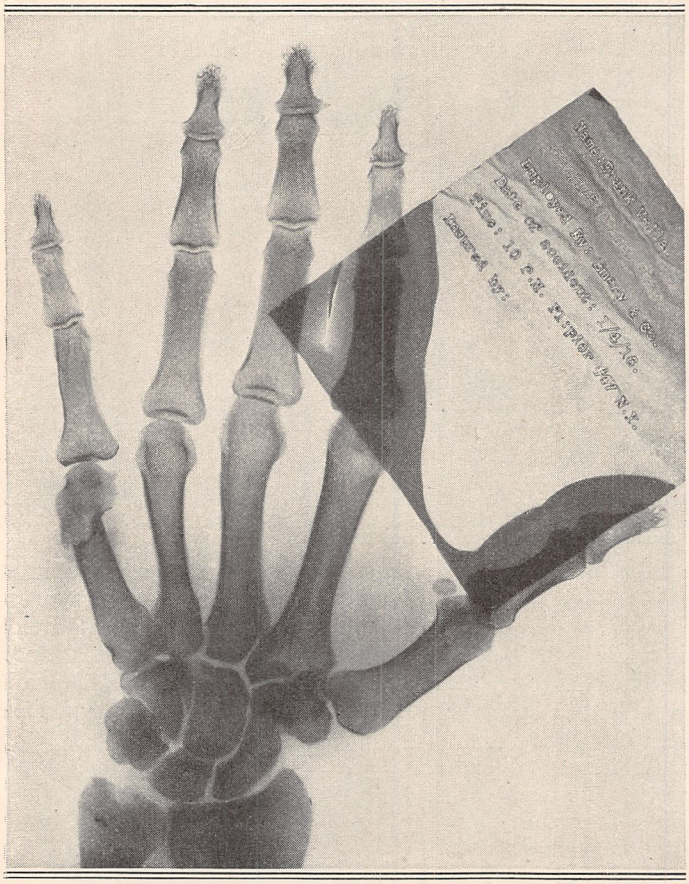
A luxurious baby cab is now on the market, the reed body of which is shaped much like a motor-car body. The engine hood is well reproduced and openwork reed in front represents a radiator. Below the radiator may be hung a metal sign on which appropriate figures can be printed. Other features are the reed mud guards, a windshield of the regular design, and small lamps, one at each side. The hood of the cab extends forward even with the windshield and has a round glass window in either side. The upholstery is of corduroy.



A Windshield, Number Plate, Lamps, and Fenders Are Features of This Baby Cab, Designed to Resemble an Automobile

TIN FOIL USED TO LABEL X-RAY PHOTOGRAPHS

A new method of labeling X-ray photographs, or radiographs, with identification data, which is simpler than the means now employed, has been patented by a New York physician. Wherever large numbers of radiographs are taken it is essential that each one be marked with the proper name, date, etc., in such a manner as to avoid mistakes in use. Reliable identification is very necessary where plates are being used as legal evidence. In many states the courts will not accept radiographs as evidence unless unmistakably labeled. At present a celluloid container is commonly used, into which letters and figures mounted on celluloid plates are inserted. With this device the data is made a part of the photograph. But such letters are cumbersome and easily disarranged. The new method consists in writing with a stylus, or typewriter, on very thin sheet lead, or tin foil, and placing this sheet on or beside the object to be photographed. Because those portions of the tin foil that are made thinner by the stylus or typewriter offer less resistance to the X-rays than the rest of the sheet, the writing appears in the photograph, which may be reliably identified thereby.



An X-Ray Photograph, Including the Reproduction of the Tin-Foil Label on Which Data has been Written

TESTS SHOW GROSS ERRORS IN MEASURING GAS

Investigation by the Bureau of Mines has revealed the fact that gross errors—sometimes amounting to 10 per cent and more—in many cases have been made in measuring natural gas under pressure. This is due to the false assumption that a certain law of physics applies to natural gas, namely, that its volume varies inversely as the pressure applied to it. While this holds true regarding "ideal gas," it does not apply accurately to natural gas except at pressures close to atmospheric. As it happens, much natural gas is measured at pressures as high as 300 lb. per square inch. These tests, which were conducted with Pittsburgh gas, showed that at 100-lb. pressure there is an error of three per cent if this law of physics is applied without correction; at 375-lb. pressure, the error is 11 per cent. This means that if a distributing company buys gas at

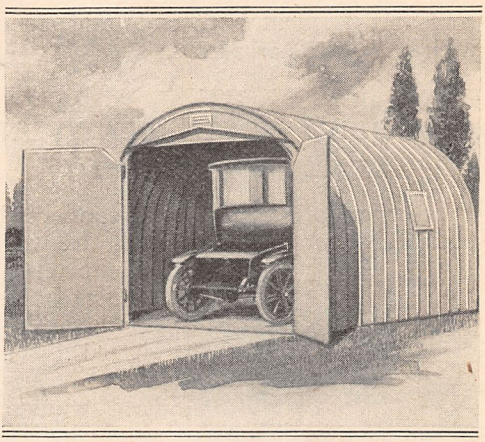
high pressure without making a correction as to measurement and sells at low pressure it may sell more gas than it pays for.

ROAD SECURES FIFTEEN NEW POWERFUL LOCOMOTIVES

Fifteen passenger locomotives of the "Pacific" type, which well illustrate the steady tendency that has existed for many years to build larger and larger engines, have recently been put into service by the Chicago, Burlington & Quincy Railroad. These new giants of the rails are 75 ft. long with tender, 15 ft. 3 in. high, and weigh 215 tons; their drivers are 74 in. in diameter and they have a tractive power of 42,000 lb. Ordinary engines used by this road on other than its main lines are 53 ft. long with tender, weigh 77 tons, and have a tractive power of 13,000 lb. The great weight of the new locomotives is so evenly distributed that they do not pound the rails as do some of smaller size, and it is said they subject the track to less wear and tear than many lighter engines. Their power is more than sufficient to haul their loads.

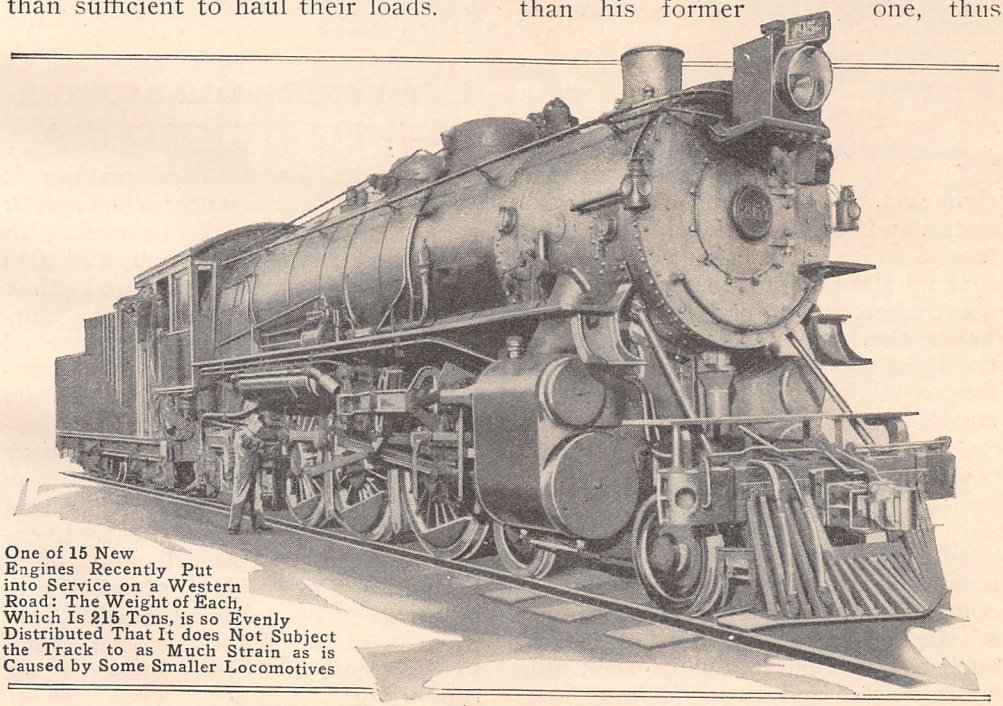
ADJUSTABLE GARAGE BUILT FOR MOTOR OWNERS

One of the features of a new type of sheet-metal portable garage which has been developed of late is that it may be



This Metal Garage may be Expanded to Fit Cars of Various Sizes

enlarged at any time by bolting additional sections to it. This enables an owner to expand the housing upon purchasing a new machine which is larger than his former one, thus



One of 15 New Engines Recently Put into Service on a Western Road: The Weight of Each, Which Is 215 Tons, is so Evenly Distributed That It does Not Subject the Track to as Much Strain as is Caused by Some Smaller Locomotives

eliminating the expense of purchasing a more commodious shelter at the same time. The sections are made in sizes which may be conveniently handled, so that the work of moving the housing after it has been taken apart is simplified. It is provided with a rounded roof and fitted at both ends and sides with wire-glass windows.

ARM BAND HOLDS FLATIRON WIRE OUT OF WAY

In order to keep the wire connected with a flatiron up and out of the way of the user, an arm band has been designed by a North Dakota woman which, if worn by a laundress, will hold such a line so that it will not be an interference. Attached to the band, which buckles above the elbow of the right arm, is a short cord provided with a stud and socket fastener. This is intended to be looped about the wire so that no slack occurs in the latter at a point where it can hinder the operator. When the iron is set at one side, and the laundress wishes to have her arm free, a slight jerk unfastens the loop and drops the wire.

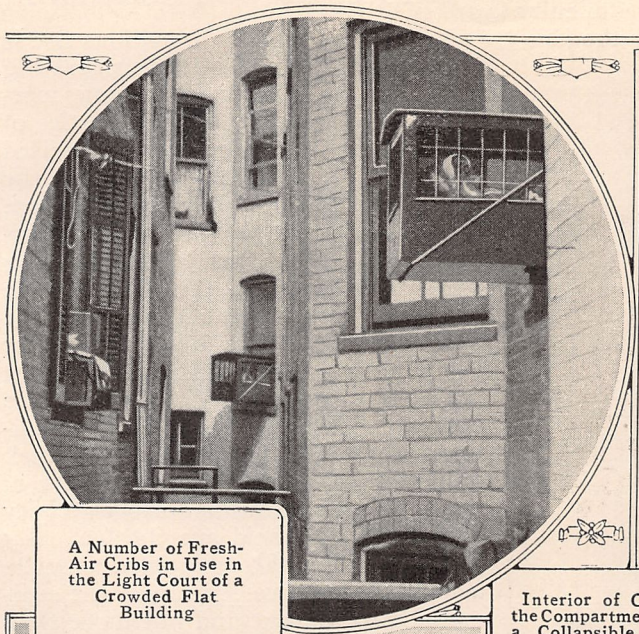
FUEL-OIL STORAGE TANKS FOR NAVAL PURPOSES

With the increased use of oil-consuming engines in naval vessels has come the problem of devising means of storing large quantities of fuel in such a way that it will be accessible when needed and also safe from bombardment by an enemy. As a result a British firm has lately designed two types of storage tanks which have attracted interest. One of these is submersible and consists essentially of a cylindrical shell, 150 ft. long and 30 ft. in diameter, fitted with curved ends and internal dividing bulkheads of dished form. A ballasting compartment is provided at each end, the total capacity of which is greater than the reserve buoyancy of the loaded vessel, enabling the device to be sunk to any reasonable depth of water, or to the bottom of a harbor. The fuel capacity of this tank is 2,400 tons. To return the tank to the surface after sinking it, compressed air is used to force out the ballast. When this means is not feasible, the vessel may be raised by pumping out a quantity of oil or water from its compartments. The other type of tank is larger than this, being 450 ft. long and about 50 ft. in diameter. Its capacity amounts to 20,000 tons. It is intended to remain afloat when loaded, and is arranged so that water takes the place of oil as the latter is discharged, giving the tank almost the same draft at all times.

CLIP HANDLE FOR BLOTTER AMONG LATE NOVELTIES

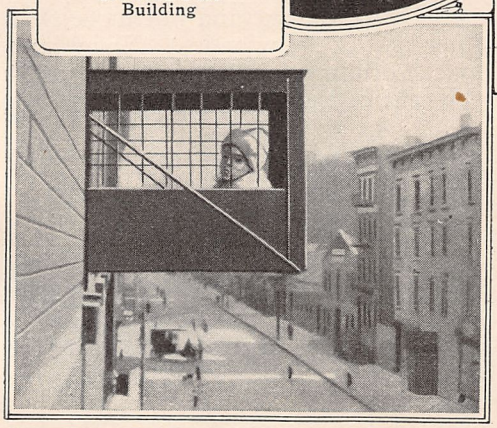
With the intention of making it easier to find one's blotter when a desk is littered with papers, and also to insure against the wrong surface being used through accident, a button clip has been devised which may be fitted to one edge. It is raised sufficiently to enable it to be used as a handle and is not so large as to be clumsy. It may be attached or detached quickly, and when in place grips the blotter firmly so that there is little likelihood of its slipping off.

GIVING THE CITY BABY AIR AND SUNSHINE



A Number of Fresh-Air Cribs in Use in the Light Court of a Crowded Flat Building

Interior of One of the Compartments and a Collapsible Metal Carriage Designed to Slip Inside of It



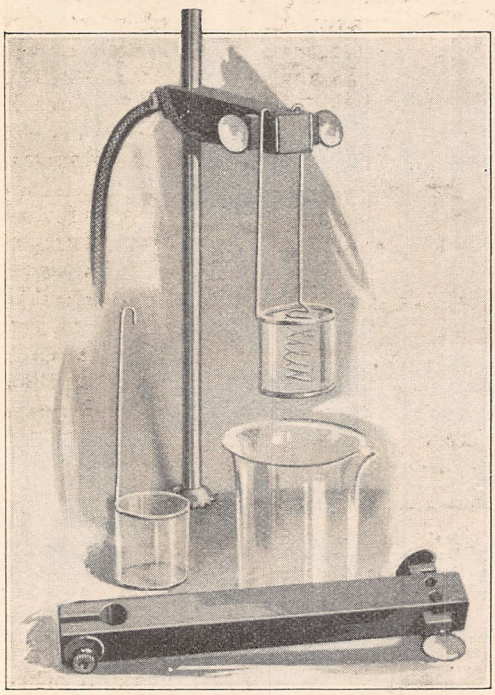
One of the Cribs Shown Suspended Several Stories above a Street

In order to provide a means whereby babies confined in city apartment buildings and tenement houses may get plenty of sunshine and fresh air, a crib has been designed that may be suspended from a window. The device, a box-shaped housing made of metal, will sustain a load of fully 500 lb. when anchored in place, so a child within it is safe and needs no more attention than if in a nursery cradle. The crib is heavily screened on three sides and tightly roofed. Air and sunshine are admitted, but flies and other insects are kept out. A neat steel carriage with a wire body is built as a part of the outfit, and is arranged so that it may be collapsed and slipped into the little house. This eliminates the necessity of employing a special basket in the latter. Since verandas and lawns are as unknown in the residence-apartment section of a big city as in the slums, the window cribs are to be seen in both well-to-do and poor districts. It is not uncommon for them to be anchored in windows four or five stories above the pavement, or in the light shafts of buildings.

RUSTPROOF BINDING POST USED IN LABORATORY

In an eastern chemical laboratory a noncorrosive binding post has been devised for use with electrolytic apparatus. Ordinarily contact is made through the setscrews that hold the electrodes in position. The current is eventually interfered with by the

deterioration of these members, which is due to the action of acid that escapes in the form of spray. This difficulty has been obviated by making the elec-



Noncorrosive Binding Post in Use

tric contact entirely independent of the screws. Hard rubber, or some similar material, is used for the arm which holds the electrodes at its outer end by means of a pair of brass pieces provided with setscrews and attached at opposite sides. Two glass tubes, each with a platinum wire fused through its sealed end, are countersunk in the upper side of the arm. The other ends of these wires are joined to copper wires leading to a switch. The tubes are filled with mercury. By bending down the wire stems of the electrodes, so that they are shaped like hooks, and dipping them into the vials of mercury, a noncorrosive contact is formed.

¶ Mines are said to have been set adrift with imitation periscopes projecting therefrom with the hope that enemy ships will be sunk when they attempt to ram what appear to be submarines.

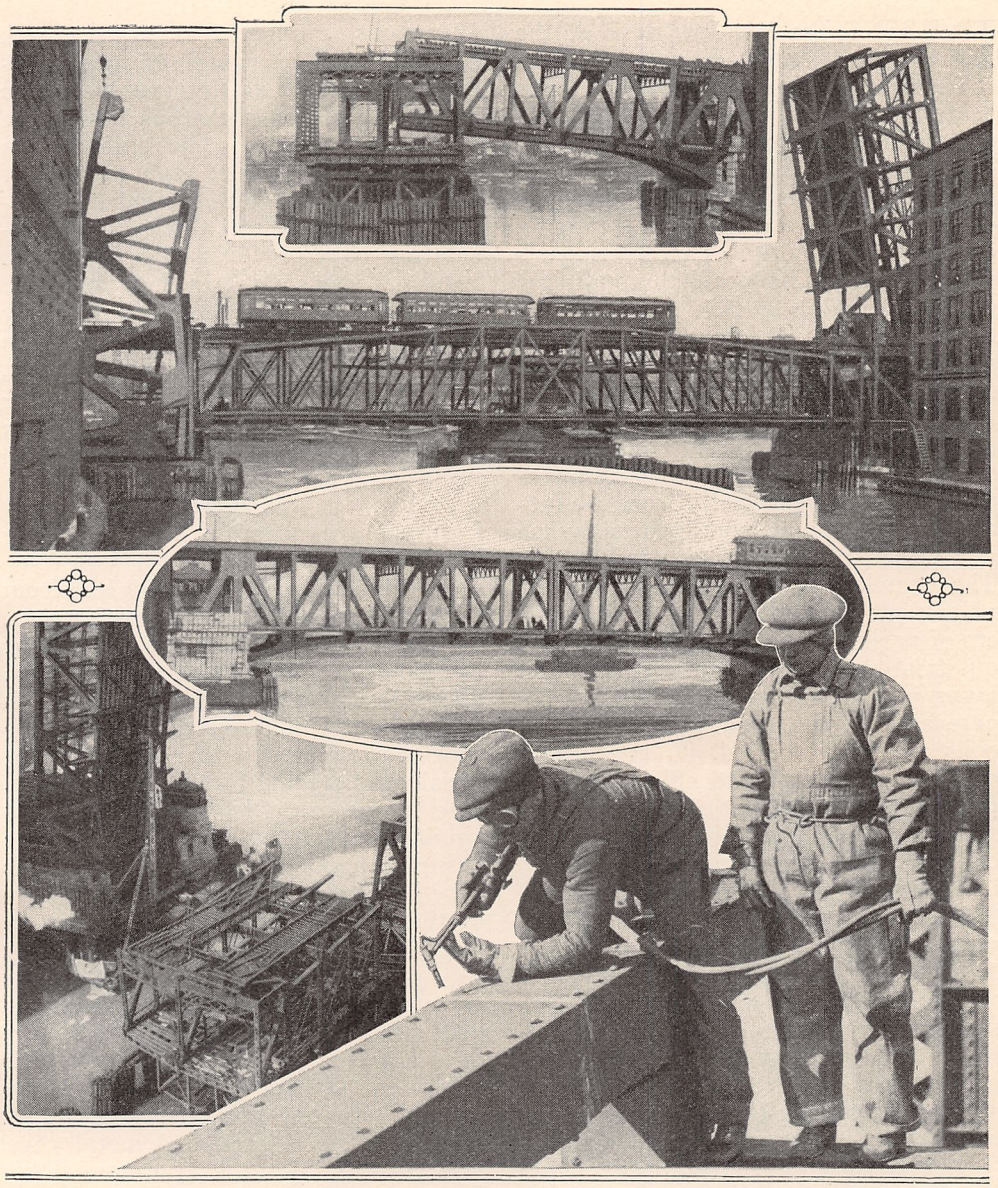
SEDIMENT IN WINE BOTTLES FROZEN BEFORE REMOVAL

An odd as well as ingenious use is being made of an electric refrigerating apparatus by a New York wine merchant. He has some 700,000 bottles of Italian wine in storage and has devised a means of materially lessening the loss which results when the dregs are blown out after the products of fermentation have settled. Refrigerating coils are arranged beneath a large table provided with holes into which the necks of bottles may be fitted. After the wine has fermented and settled, the bottles are placed neck down in these openings. In this position the sediment is allowed to freeze at the cork while, by lowering the temperature of the liquid, fermentation and the activity of the carbonic acid are checked. By then removing the cork from a bottle a small piece of ice containing the sediment is blown out and not more than 2 per cent of the wine lost. Sometimes by the ordinary method as much as 10 per cent of the liquid escapes.

ACETYLENE CUTS PLACE FOR NEW DOUBLE-DECK BRIDGE

Chicago's $650,000 double-deck bascule bridge at Lake Street and the Chicago River—said to be the greatest bridge of its kind ever built—was completed in March of this year, taking the place of a swinging bridge having the same location. The new structure has been building since March, 1914, but for only one week—while the old bridge was being torn away—was traffic entirely shut off on the elevated line. Preliminary plans for the new bridge were drawn in 1912 and described in the September issue of Popular Mechanics Magazine of that year.

This bridge, like its predecessor, is to be used by both elevated trains and street-level traffic. It was imperative that it be closed as brief a time as possible. To meet this difficult requirement the two leaves of the bridge were built perpendicularly above the ends of the old structure, enough of the frame-



Insert, Top: The Old Double-Deck Bridge Swung Open and One Leaf of the New Bridge Almost in Place, Projecting into Gap Formed by Cutting Away Center of Old Structure with Acetylene Torches. The Large Upper Picture Shows the Leaves of the New Bridge being Built above the Old One in Such a Way as Not to Interfere with Traffic. Oval Insert: Elevated Train Using New Bridge after Traffic had been Blocked Only a Week. Below, Left: Old Bridge Showing Where Central Portion was Cut Out by Use of Acetylene Torches. Below, Right: Workmen with Acetylene Torch Cutting Away a Center Section of the Old Bridge to Allow the New Leaves to be Lowered as Shown in the Upper Insert

work between the sides of each leaf being left out to allow elevated trains to use the upper level without hindrance. When all was in readiness the old bridge was swung open and its ends blocked up on previously prepared structures in the center of the river. Men with acetylene torches then set to work as rapidly as possible to cut away the central portion of the old steel structure, thus making room for the new leaves to be lowered into place. After this had been done the remainder of the old bridge was dismantled.

REMARKABLE MILLION-VOLT TRANSFORMER

DURING the last few days of the Panama-Pacific Exposition both scientific and popular interest was centered upon a 60-cycle, 1,000,000-volt transformer which was publicly demonstrated. The apparatus is one of the late and noteworthy inventions of the electric world and was used in carrying out a series of interesting investigations. The peculiar conditions relating to high-tension currents and their long-distance transmission were particularly considered during the course of these experiments.

The instrument represents a radical change in the design and construction of electric transformers. Its arrangement is simple, especially from the mechanical viewpoint, and apparently has a number of advantageous features. The principle is to be used in the development of commercial transformers of various capacities. Some of the outstanding points presented in its favor are its ability to withstand severe abuses, the ease with which its coils may be repaired, its attainment of the highest full-load efficiencies, its great overload capacity, and the indestructibility of the coils by short-circuiting. The apparatus was built and installed at an approximate cost of $36,000, and raised a 60-cycle, 2,200-volt current to a potential of about 1,000,000 at the same frequency.

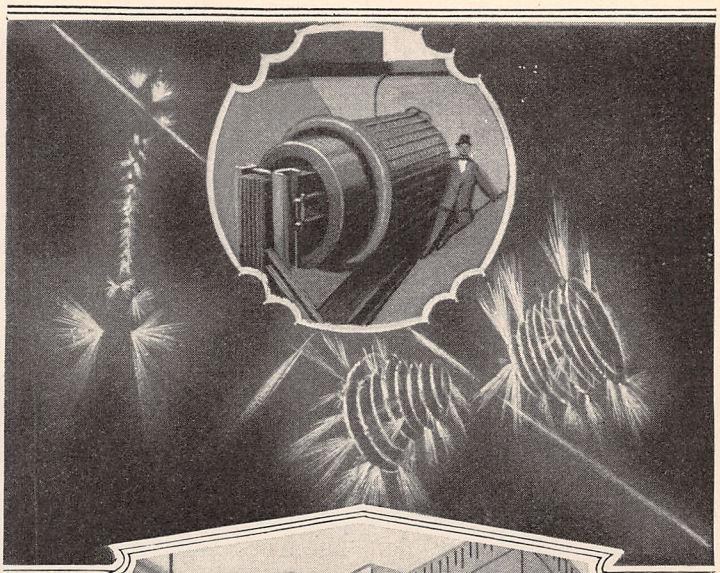
While in use at San Francisco it was mounted in an open, V-shaped, metal-lined, concrete tank, sunk in the ground and filled with insulating oil so that the electrostatic shield was submerged about six inches. The transformer house was a large frame structure which, in order that the danger of fire might be avoided, was held together by bolts placed parallel with the high-tension wires. Nails were not used in its construction.

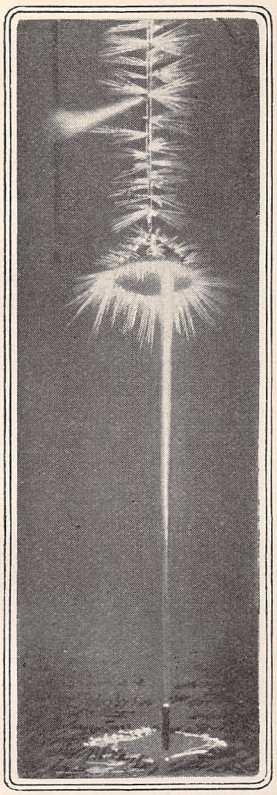
Four hundred miles of paper, copper, and aluminum ribbon were used in winding the low and high-tension coils. The primary consists of 122 sections wound with copper ribbon and double layers of paper. These coils are designed for 1,150 volts and divided into 61 groups, connected in parallel with bus bars. The windings are safeguarded against static trouble by the grounding of one of the bus bars to the transformer frame. The high-tension coil has 190 sections, each capable of developing 5,300 volts, wound with aluminum ribbon. Three thicknesses of insulating paper are used between each turn. A unit, 5 ft. 7 in. long and 2 ft. 4 in. in external diameter, is formed by the assembled primary coils, while the high-tension members form a cylinder, 5 ft. 11 in. long and 4 ft. 3 in. in outside diameter. A paper tube, weighing approximately 2,000 lb., and having a length of 7 ft. 7 in. and a thickness of 6 in., insulates the primary from the secondary element by being inserted between them.

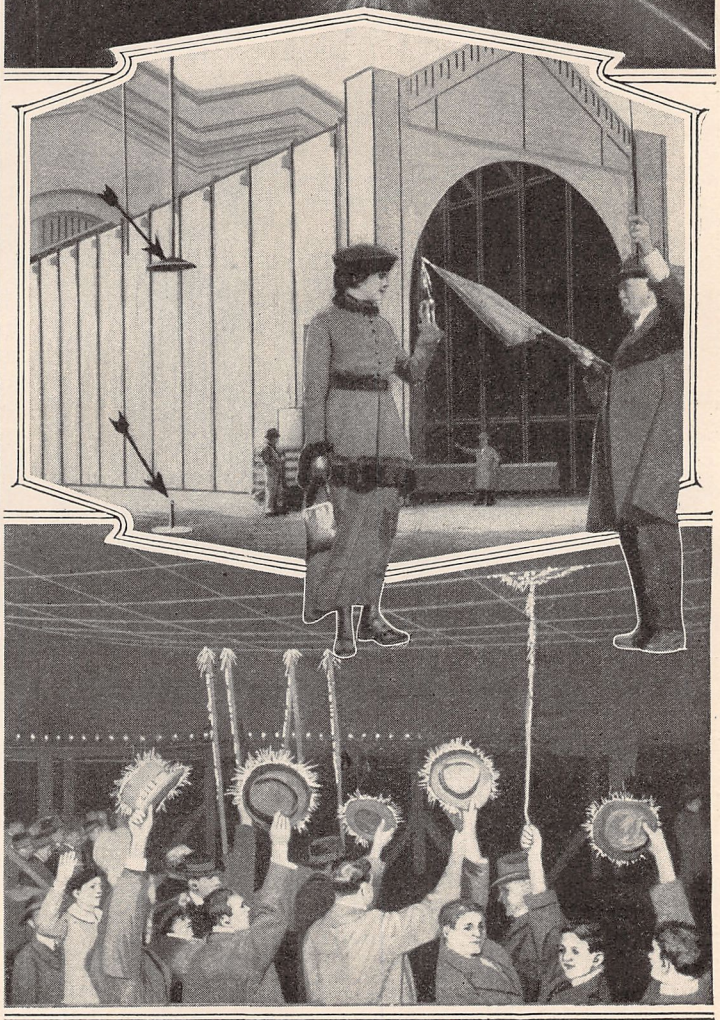
At a distance of about 100 feet from the transformer house an aerial screen, 50 ft. square, was suspended from four tall poles. This was stretched 35 ft. above the ground, and 10 ft. beneath it a second network, made of hemp rope impregnated with insulating material, was erected for safety purposes. The high-tension leads were held by similarly insulated ropes, and at the suspension points were provided with wire baskets to prevent the combustion of the latter being caused by corona discharges. An adjustable horn gap was provided in the main lead to the screen. This consisted of a metal disk suspended in the air immediately over a water jet, the nozzle of which projected several inches above the ground. In one corner of the transformer house a grounded metal cage was provided for the operator. This inclosed and protected the switches, circuit breaker, and other controlling instruments.

When the transformer was in action the house was so charged with electricity that sparks could be drawn from bolts, door hasps, padlocks, and other metal articles. The aerial screen was highly luminous and hummed with a peculiar sound. The safety net of impregnated rope was so highly charged that sparks a foot in length could be

Insert at Right Shows Million-Volt Transformer in Its V-Shaped, Metal-Lined Vault. The Corona Effects Visible in the Surrounding Field are Illuminating a Pair of Insulating Baskets and the Aerial Conductor. The Beautiful Static Display Pictured Below Resulted When the Current was Grounded through a Stream of Water Directed against a Metal Disk Suspended from the Conductor Wire







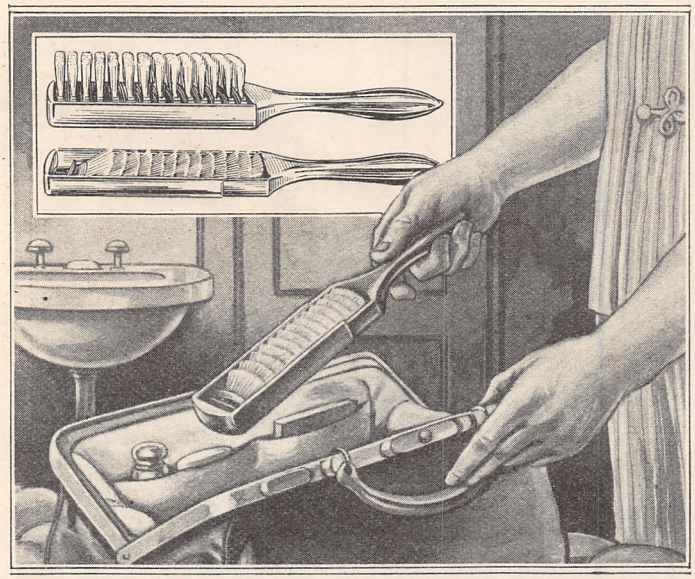
Transformer House and Adjustable Horn Gap, Indicated by Arrows, Are Above at the Right. The Man before the Building is Imparting a Charge to a Spectator by Holding Aloft an Iron Rod and Extending an Umbrella toward Latter's Uplifted Hand. At Right: Crowd beneath the Aerial Screen Holding Hats and Other Objects in Air to Observe Electrostatic Effects, Exaggerated Here for Clearness

drawn from it with grounded conductors. When the horn gap was closed and a discharge made to the earth from the screen, spectators beneath the aerial noticeably felt the retarding effects of the electricity, which gave them sensations likened to those experienced by divers when walking under water. Persons could stand on wooden boxes and draw sparks from 3 to 6 in. in length from passers-by. Vacuum tubes and incandescent lamps glowed when brought beneath the screen, while umbrella ribs, wires, and other metallic objects glowed with corona and emitted sparks. Hairpins, brooches, and like articles, were frosted with sparks and the atmosphere permeated with the odor of ozone.

The transformer is to be installed at Chicago, where its inventor will continue the experiments, which were cut short at San Francisco by the closing of the exposition.

COLLAPSIBLE HAIRBRUSH FOR TRAVELERS

Particularly for the convenience of travelers, a hairbrush has been invented which is collapsible. The bristles are set in transverse rows in flat steel frames which are so fastened to the back of the brush that they can be made to lie down flat by pulling the handle. In this position they are fully protected by the sides of the metal back. By pressing the handle back into place the bristles are made to resume their upright position. The construction is simple, and if of good material such brushes will wear well.



This Collapsible Hairbrush, Designed Especially for Travelers, is Operated by Sliding the Handle Back and Forth

SIXTY-YEAR-OLD MINE FIRE CAUSES FRESH TROUBLE

For more than 60 years a subterranean fire has been raging in one of the great anthracite-coal veins near Summit Hill, Pa. A number of years ago, at a cost of approximately $1,000,000, an enormous concrete wall was erected in the path of the fire in order to confine it. This is some 15 ft. thick and extends to a depth of about 100 ft. in the ground. Reports were recently circulated that the fire had made its way past this barrier and was threatening one of the world's richest anthracite veins in the Panther Creek Valley. The chief engineer of the company controlling the fields refutes this assertion, but states that there is some likelihood of the fire continuing in a westerly direction at a level below that of the concrete wall. In anticipation of this, numerous holes are being drilled into the old workings to permit their being slushed with a mixture of water and culm. Steam shovels are also at work in the burning vein removing the coal ahead of the fire. These operations are being conducted a short distance west of the barrier.

Above is Pictured Nearly a Block of Frame Residences Wrecked beyond Hope of Repair by the Explosion of a Half Ton of Dynamite. The Condition of the House Below at the Left Is Typical of That of Others Standing Adjacent to the Place Where the Detonation Occurred. In the Lower Right-Hand Corner is Shown All That Remained of a Motor Car and Its Garage

HOUSES RAZED BY DYNAMITE BLAST IN MISSOURI TOWN

Two persons were killed and nearly a hundred others injured when a half ton of dynamite recently exploded in a residence section of Maplewood, Mo. The force of the detonation demolished a dozen houses and smashed windows for several miles in all directions. Large buildings were rocked in neighboring towns and the concussion was felt over a large area. The explosive was stored in a small shanty erected by a construction company engaged in building a sewer. From some unknown cause fire broke out in the structure and caused the explosion. Two blocks of frame houses were shattered, many of them entirely beyond repair. At one place the rear ends of a whole row of frame dwellings were blown off. The explosion dug a hole approximately 20 feet in diameter and 10 feet deep in the ground where the dynamite shed had stood. Practically all of the damage was done by the blast, as the few fires that developed were readily controlled.

NEW FLY SWATTER IS MADE OF FLEXIBLE RUBBER

Quite a number of apparently good points are embodied in a fly swatter of recent invention which is being introduced. The paddle part of the device is made of soft, perforated rubber instead of wire or screening. Its flex-

ibility renders it effective wherever used, for the rubber conforms to the shape of the surface against which it is struck. Furthermore there is no danger of scratching highly polished furniture with it. Since it is free from metal, it is especially adapted for coast cities where the atmosphere is more or less salty. It may be washed frequently and kept in a perfectly sanitary condition.

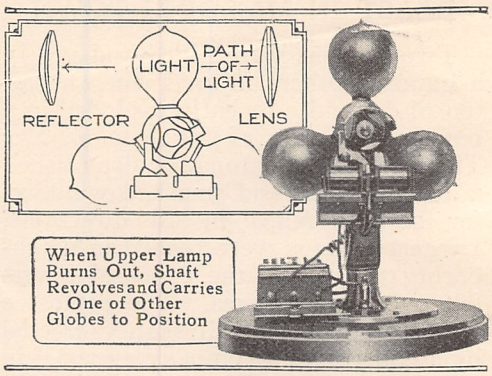
Since It Is Flexible, the Rubber Swatter Conforms to the Shape of the Surface against Which It is Struck and does Not Mar Polished Furniture

SUBMARINE TELEPHONE LINE FROM KEY WEST TO CUBA

Plans are now being perfected for establishing a telephone line between the United States and the island of Cuba. The project, which should mean much to the commercial interests of both countries, has the hearty support of the Cuban government. It is proposed to extend a line down the east coast of Florida to Key West and to lay a cable from that point across to the island, a distance of about 90 miles. It will be the first submarine telephone line between these two countries.

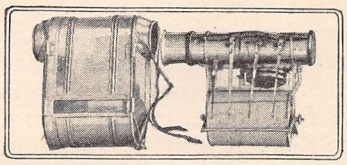
LIGHTHOUSE LAMPS TENDED BY INGENIOUS DEVICE

Several of the government lighthouses have of late been equipped with an apparatus designed to place a new incandescent lamp before the lens in case the one in service should burn out or for some similar reason fail to function. The device consists of a three-socket disk mounted on a horizontal shaft. A set of three lamps are held 120° apart, the upper of them being the only one in focus or ignited. Fixed at one end of the shaft is a coil spring of sufficient strength to revolve the lamp holder once, while at the opposite end a latch, controlled by electromagnets, and an escapement wheel, with three teeth set equidistantly about its circumference, permit a movement of only 120° at a time. When the upper of the lamps—or in other words, the one in service—burns out, the circuit passing through one set of magnets is broken and the other immediately energized, causing the armature to be drawn over, the latch released, and the shaft to make a third of a revolution. This brings the second lamp into position and lights it. The action is completed in a fraction of a second.



When Upper Lamp Burns Out, Shaft Revolves and Carries One of Other Globes to Position

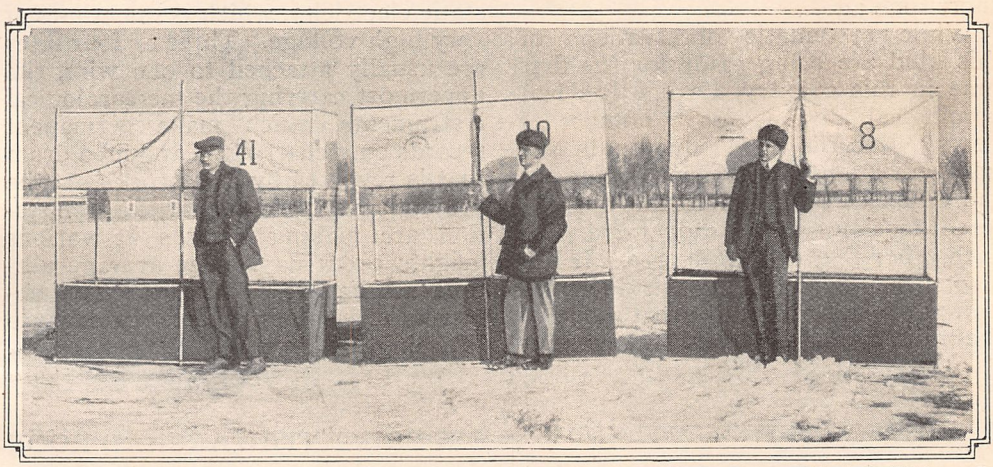
STUDYING UPPER AIR WITH AID OF KITES



The Humidity, Temperature, Barometric Pressure, and Wind Velocity are Recorded by This Small Instrument Which When in Use is Attached to Kite

Computing the Altitude of a Kite with the Assistance of a Theodolite

Drawing in a Kite with an Electric Windlass after Making Observation: The Reel House Stands on a Turntable and may be Faced in Any Direction



String of Three Kites Used at the Nebraska Aerological Station: The Cloth at Top of Each Is White and That at the Bottom Black. Thus They Are Visible Whether Flying against a Light or Dark Cloud

To assist the Weather Bureau in making its forecasts, and also to enable a systematic study of the mechanics of the upper atmosphere, the government has established an aerological station near Elk City, Neb., where meteorological observations are being made daily. Conditions prevailing at elevations up to approximately two miles are being determined by means of self-recording instruments attached to box kites which are flown regularly.

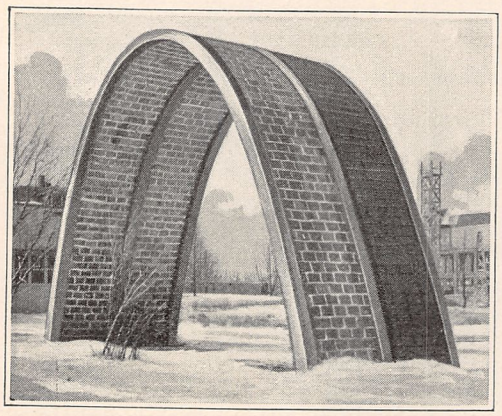
In the past our weather predictions have been based upon observations made at the ground, or in the lower strata of air. The place where storms originate, however, is in the zone lying between one and three miles above the earth. The inaccuracies of forecasts are due largely to the observer's ignorance of conditions existing in the actual storm region. By having a fairly continuous record of the wind velocity, temperature, barometric pressure, and humidity of the upper air, a forecaster has quite complete data

from which to make accurate determinations. It is primarily for the purpose of collecting information of this kind and obviating the greatest chances for mistakes in weather predictions, that the kite-flying station is being operated.

The results of the work accomplished at Elk City will doubtless determine whether other stations will eventually be established elsewhere in the West. While the observations made in Nebraska are expected to be of considerable value, it is not assumed that this single station will be at all adequate for the needs of the bureau. The institution was first located at Mount Weather, Va., but the efforts made there were of little value in forecasting, because storms develop in the West and move toward the Atlantic seaboard. For that reason the plant was transferred to its present site a short time ago.

While systematic observations of this kind are being made for the first time in this country, Europe has had aerological stations for a number of years. Records of conditions in the upper air are made at various points on the Continent, and before the war different foreign stations coöperated with each other to a certain degree. It has also been found that the information thus gathered is of great value to the military aerial forces. Likewise, it is considered that such stations would be of much benefit to our fliers should the government ever decide to develop a real aeronautical force.

The Nebraska aerological station has about 35 kites of different sizes at its disposal. A reel house, mounted on a turntable so that it can be faced in various directions, is provided in the middle of a 40-acre tract of ground. In this an electric motor and windlass are used in drawing down the kites from the clouds after observations have been made. Often kites are kept up continuously throughout a day and night, while at other times ascensions are made periodically. During cold weather the wire holding the kites often becomes thickly coated with ice, while during thunderstorms it is not unknown for it to be burned in two by electricity. The reel is heavily insulated as a protection against the static electricity, which is sometimes of very high voltage. Three or four kites are usually attached to one wire, the uppermost carrying the meteorological instruments which make permanent records on a chart fitted around a drum that is revolved by clockwork. At the present time those in charge of the station are making records at various heights every day. The average altitude reached is two miles. The observers make their reports regularly to Washington by wire.



Section of Experimental Arched Roof Made of Clay Blocks

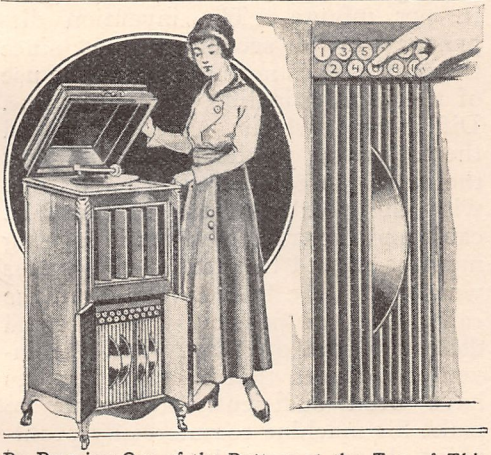
EXPERIMENTAL ARCHED ROOF MADE OF CLAY BLOCKS

Clay blocks have been used in constructing an arch which stands alone, seemingly without any clear purpose, on the grounds of the Iowa Agricultural Experiment Station at Ames. The structure, however, represents a model section of a proposed roof for barns. Attempts have been made for some time to design a thoroughly practical type of fireproof building for agriculturists, and this odd-looking member, strengthened by reinforced-concrete ribs, is the result of an experi-

ment made to determine the feasibility of using one material for both the walls and the roof of a structure. One-half of it appears black, which is due to paint which has been applied. It is probable that in the near future a complete building with this type of roof will be constructed at the station.

CONVENIENT CABINET FOR PHONOGRAPH RECORDS

A simply constructed cabinet for holding phonograph disk records consists of a series of narrow, vertical compartments, in each of which one record may be set on edge. At the top of each compartment is a push button, lettered or numbered for the convenience of the owner; each button operates a simple set of levers. By pushing one of these buttons the corresponding record is moved forward an inch or two so that it projects from the cabinet and can be easily grasped by the hand. The floor of the case slants slightly downward to the rear so that records will not roll out. An



By Pressing One of the Buttons at the Top of This Record Cabinet the Corresponding Record is Moved Far Enough Forward to be Grasped by the Hand

alphabetical index shows the compartment in which each record is placed.

¶ Replicas of quaint old English lanterns with horn sides are coming into use for halls, dens, and the like.

REMARKABLE OIL SPRINGS DISCOVERED IN ALASKA

Five marvelous springs of oil, which, according to the discoverer, surpass similar phenomena in well-known oil

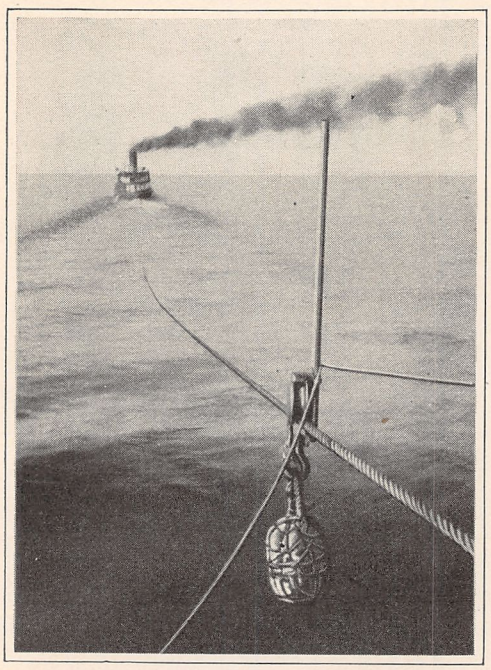
The Oil as It Flows from One of Five Oil Springs Recently Discovered in Alaska North of the Arctic Circle

regions, have been located in Alaska far beyond the arctic circle. The discoverer is a member of the United States Bureau of Education. With reindeer he traveled 450 miles to see the phenomenon of "liquid that never freezes," about which the wondering natives told him. The oil deposits a residue, amounting to about five per cent of the volume; this deposit has formed a mound around the springs about 50 feet high and 600 feet in diameter. The oil flows into a small lake, on the surface of which ducks and geese often alight never to rise again. The heavy oil so clots on their wings that it is almost impossible for them to fly.

The discoverer reports that there are hundreds of tons of semifluid oil here which has the appearance of vaseline, a large part of the mound surrounding the springs being composed of this valuable substance.

FOG STICK HELPS STEERING OF LAKE BARGES

When a large barge is towed behind a tug or steamer during murky weather on the Great Lakes, a device known as



This Shows One of the Sticks in Place on a Towing Cable ahead of a Barge. Just the Top of the Fog Stick Is Visible to a Man at the Wheel

a fog stick is frequently employed to assist the helmsman in steering the trailer. This consists of a short pole leashed to a pulley which is let out some distance forward of the bow on the barge's towline and kept in an upright position by means of a weight, such as a sandbag or stone. Thus when the atmosphere is so foggy that it is impossible to see the tug from the barge, the stick, which is held in one position by ropes, indicates the direction in which the cable is being pulled. At night a lantern is swung from the top of it so that the stick continues to fulfill its function.

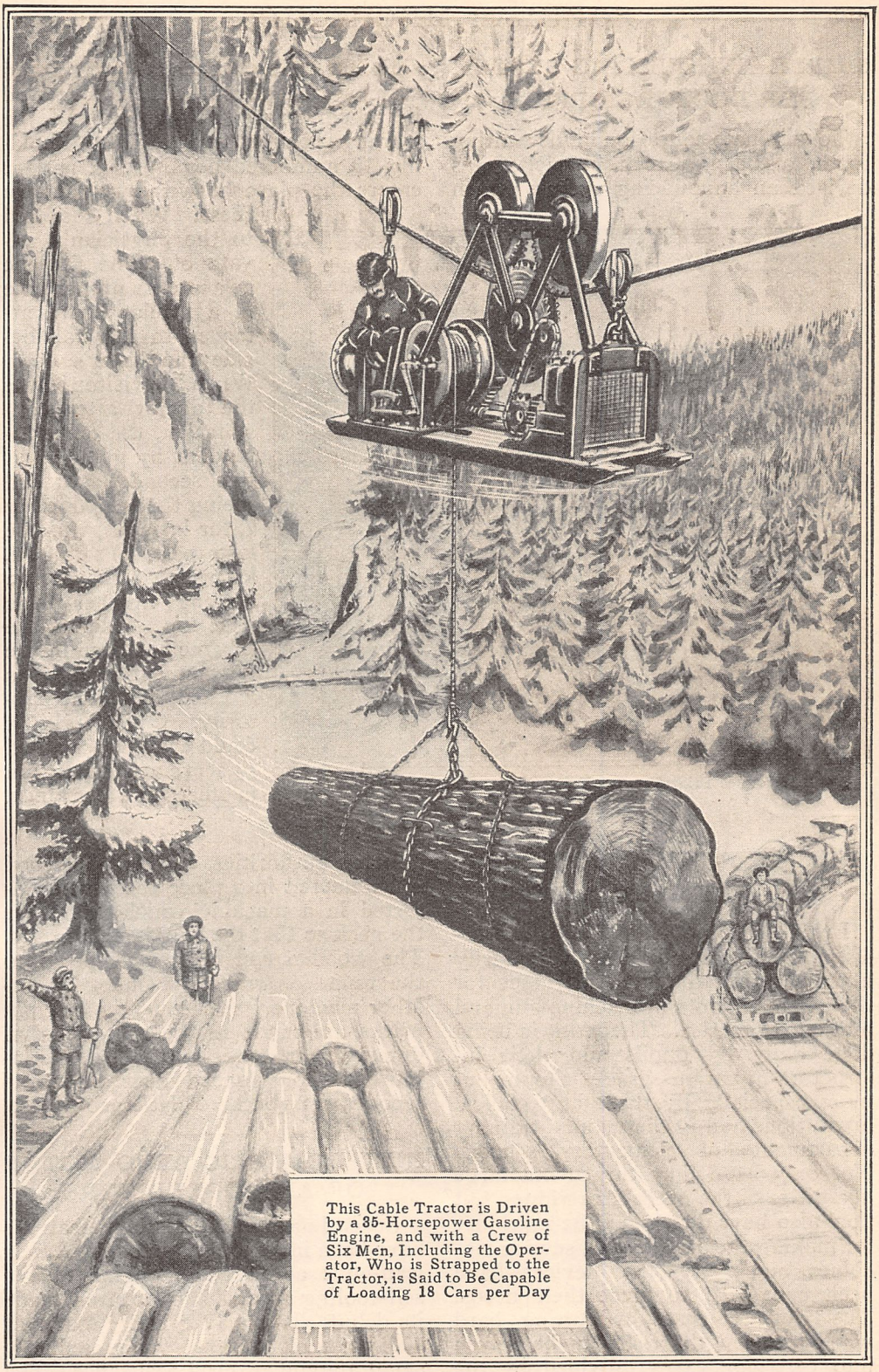
¶ Spanish officials at Madrid have approved of a new type of radiogram receiver that does away with ear pieces and is said to have a range of 3,100 miles.

GASOLINE CABLE TRACTOR FOR AERIAL LOGGING

An eastern lumberman has patented a tractor which operates on a suspended cable as an aerial tramway and is designed to be used for aerial logging. The three sheaves to which the propelling power of the tractor is transmitted are so placed that the cable, in passing over one and under the other two, is bent slightly, giving the sheaves a grip on the cable which increases as the load increases. A 30 to 35-hp. gasoline engine and a hoisting drum and cable are suspended on a platform immediately below the sheaves. The engine operates both the hoisting drum and the sheaves. The operator is strapped to the tractor and has the advantage of having his work in full view at all times.

This tractor is designed to operate on a 2-in. cable, the distance between the cable's supports being about 1,800 feet. The engine is geared to travel in either direction up to 1,800 ft. per minute. Its maximum speed for lifting is 12 ft. per minute, and for lowering, 60 ft. per minute. The invention dispenses with all secondary lines, since the system does not necessitate the use of the usual trip line, or haul-in line. Difficulties which have suggested themselves as to the practicability of the invention commercially have to do with the ponderousness of the 2-in. cable and the tractor, which in logging must be moved frequently; the excess weight that the tractor puts upon the cable, and the possibility of personal danger to the operator. But the inventor believes that these difficulties have been sufficiently overcome to make his machine commercially profitable. It is proposed to use a small gasoline engine for spotting cars and putting up the cable.

It has been estimated that the tractor is capable of yarding and loading 18 cars per day with a crew of six men, comprising the operator, two men to place the chokers, a rigging slinger, and two men to spot the cars and place the load.



This Cable Tractor is Driven by a 35-Horsepower Gasoline Engine, and with a Crew of Six Men, Including the Operator, Who is Strapped to the Tractor, is Said to Be Capable of Loading 18 Cars per Day

SIMPLE ANNOUNCING SYSTEM FOR DOCTOR'S OFFICE

To eliminate confusion in his waiting room, a Battle Creek physician has devised an announcing system which simplifies the attendant's work and assures each patient of being received in proper turn. At one side of the waiting-room entrance is a board holding 18 numbered pegs. As a patient enters the place he withdraws one of these. When admitted to the physician's private office he fits the peg into its proper hole in a similar board attached to the wall beside the latter's door. When the visitor leaves the doctor after consultation, the office attendant by glancing at this second board and seeing that peg number 7, for instance, was the last one inserted, knows that the person holding number 8 is next in order. The scheme has been in use for some time and has worked quite satisfactorily. Obviously it could easily be adapted to serve a like function in offices of other kinds.

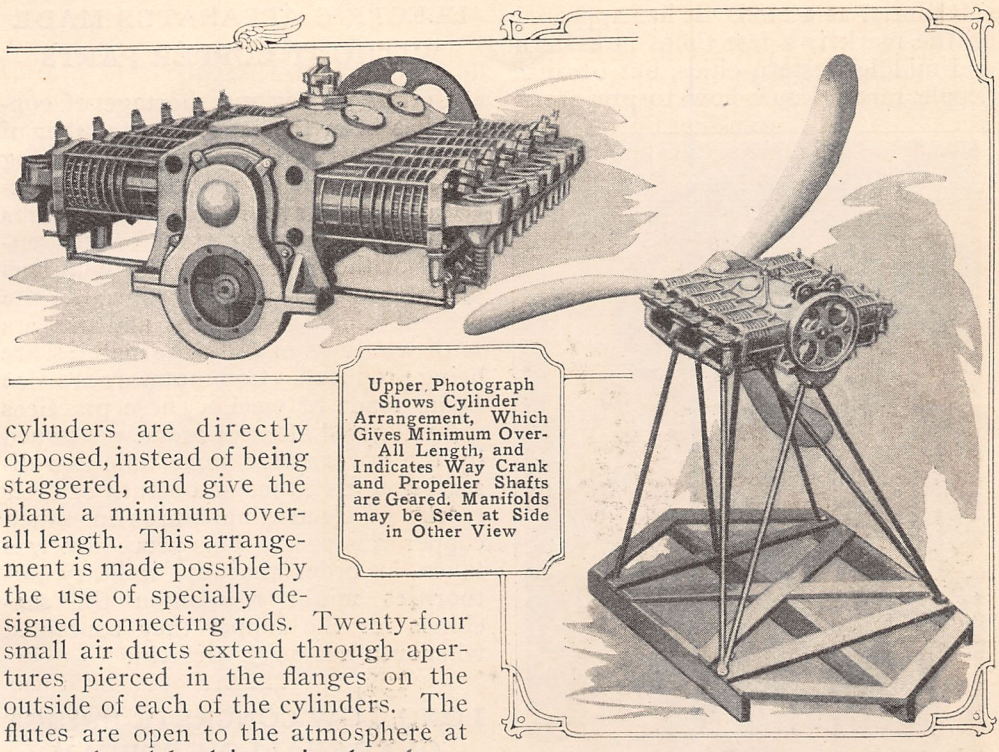
Instructions Printed across Each of the Boards Explain the Routine to New Patients

DUMMY RIFLE CARTRIDGES MADE BY SCHOOLBOYS

British schoolboys at Leeds are assisting the war office by voluntarily manufacturing dummy cartridges for the use of recruits in machine-gun and musketry practice. The work is being done daily by pupils and their instructors in various grade schools, but more especially by those at technical institutions and in the manual-training departments of elementary schools. Not only have they turned out large quantities of the needed cartridges, but they also have developed the machines for making them. Bicycles, sewing machines, and many other devices, have been converted to meet their needs. The work consists of cutting hard wood into lengths that can be driven into cartridge cases provided by the military authorities. When the wood is hammered into place the case is inserted in a machine which punctures the neck so that the slug is held firmly. The wooden end is then shaped into the rounded form of a bullet by another machine. Subsequently four pin pricks are made in the cases so that dummy cartridges may be distinguished from loaded ones after the wooden ends become blackened by use.

NEW DOMESTIC AERO MOTOR OF AIR-COOLED TYPE

Several very interesting features have been incorporated in a new American-built aeronautical engine of the self-cooling type which has lately made its debut. It is a 12-cylinder motor of 105 hp. and presents an exceedingly small amount of head resistance. The



Upper Photograph Shows Cylinder Arrangement, Which Gives Minimum Over-All Length, and Indicates Way Crank and Propeller Shafts are Geared. Manifolds may be Seen at Side in Other View

cylinders are directly opposed, instead of being staggered, and give the plant a minimum over-all length. This arrangement is made possible by the use of specially designed connecting rods. Twenty-four small air ducts extend through apertures pierced in the flanges on the outside of each of the cylinders. The flutes are open to the atmosphere at one end and lead into circular chambers in the heads. From there manifolds carry the excess heat to the carburetor. This plan enables low-grade gasoline or even kerosene to be used successfully as fuel. All of the cylinders and heads can be removed in 20 minutes to permit their examination and that of the pistons, bearings, and other parts, all of which are interchangeable. Instead of having a direct connection between the crank and propeller shafts, the two are geared so that the latter makes 900 revolutions a minute to the crankshaft's 1,800. The motor consumes 11½ gal. of low-grade gasoline an hour, weighs 360 lb., and has a forced-feed oiling system. It has been tested on monoplanes and both tractor and pusher biplanes and flying boats with apparently good results.

¶ The second national exposition of chemical industries will be held in New York in September of this year. It aims to promote the development of natural resources utilized in the chemical industry.

VEGETABLE PEAR NEW DISH IN CALIFORNIA

Among the little-known vegetables which have been introduced on the Pacific coast of late is the chuchu, a pear-shaped variety of squash known in Mexico as the chayote. It grows on a perennial vine which assumes large proportions and bears abundantly. The skin is smooth and bright yellow in color. When mature the vegetable usually weighs about a half pound. It contains a single seed which when cooked has a flavor similar to that of roasted chestnut. The vegetable itself is not highly flavored and for that reason may be used in numerous ways. On the coast it is employed in making both soups and salads. It may be stuffed with seasoned chopped meats and baked, or boiled or fried alone. It also is often pickled and preserved. The chuchu, which is commonly sold under the name of "vegetable pear," is firmer and has less water than the squash, and is understood to be quite

substantial as a food. It has appeared on the markets a few times in eastern and middle-western cities, but because people rarely know how to prepare it

The Chuchu, Which Came to This Country from Jamaica by Way of Mexico, Resembles a Pear in Shape. As may be Seen Here, the Vine Grows Prolifically. It Is Perennial and Bears Heavily

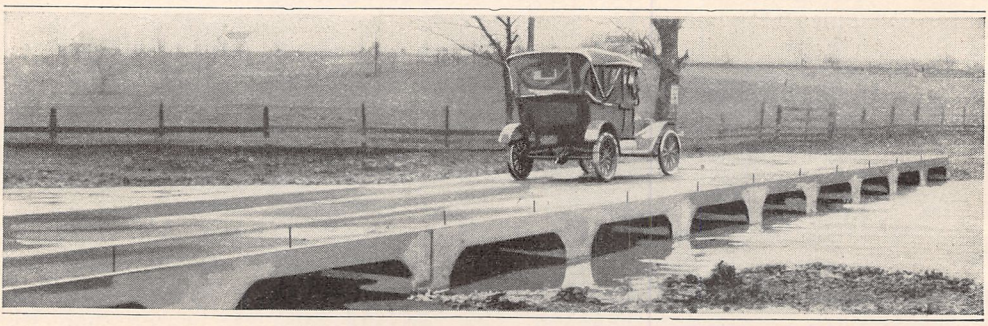
properly no particular demand has as yet been created for it in these places. In California, however, it is gaining popularity. It is very easily grown and requires little attention.

ELECTRIC APPARATUS MADE WITHOUT COPPER PARTS

Germany's serious shortage of copper has been the cause of a number of very interesting developments. Among other things it is reported that electrical firms have for several months been manufacturing transformers entirely without copper. The windings of these apparatus are of zinc. At the present time generators and motors with windings of the same material are being produced. Commutators are also being made of steel. These practices were adopted after an order was issued by the government some time ago directing firms to make a return of their stocks of electric apparatus in which copper was used. This procedure was taken in order that the military authorities might requisition the machines for the copper they contained whenever necessity dictated.

LONG, LOW CONCRETE BRIDGE OVER SHALLOW STREAM

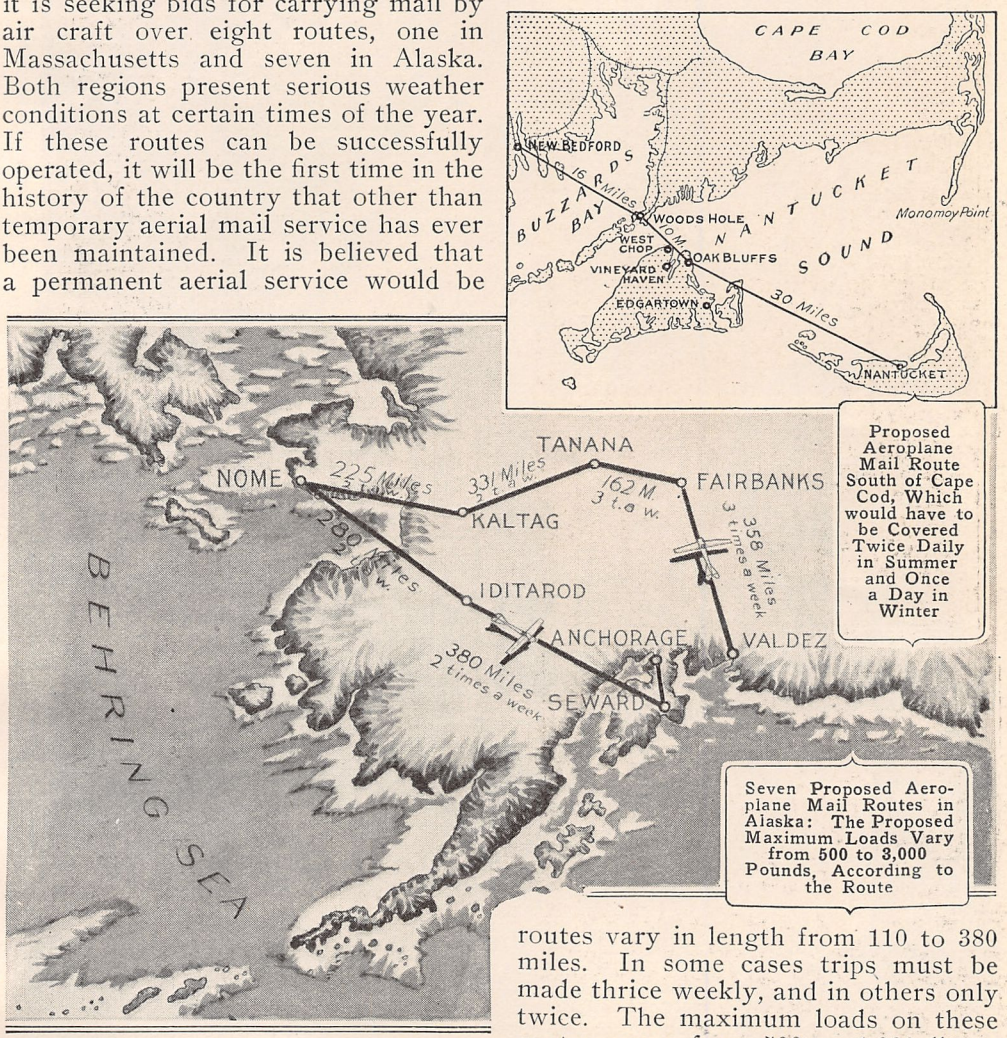
A bridge of unusual design has been constructed near Farmington, Mo., across a shallow stream, the bed of which is treacherous because of shifting quicksand. There being very low banks on either side, a level concrete bridge 16 ft. wide and 100 ft. long was built, which required no approaches. It clears the water by about 2 ft. and connects two sections of an excellent road. The bridge is supported by piers of concrete about 8 ft. apart. The cost of the structure was 750 dollars.



This Concrete Bridge, Which Is so Low as to Require No Approaches, Is 100 Feet Long and 16 Feet Wide, and Cost $750

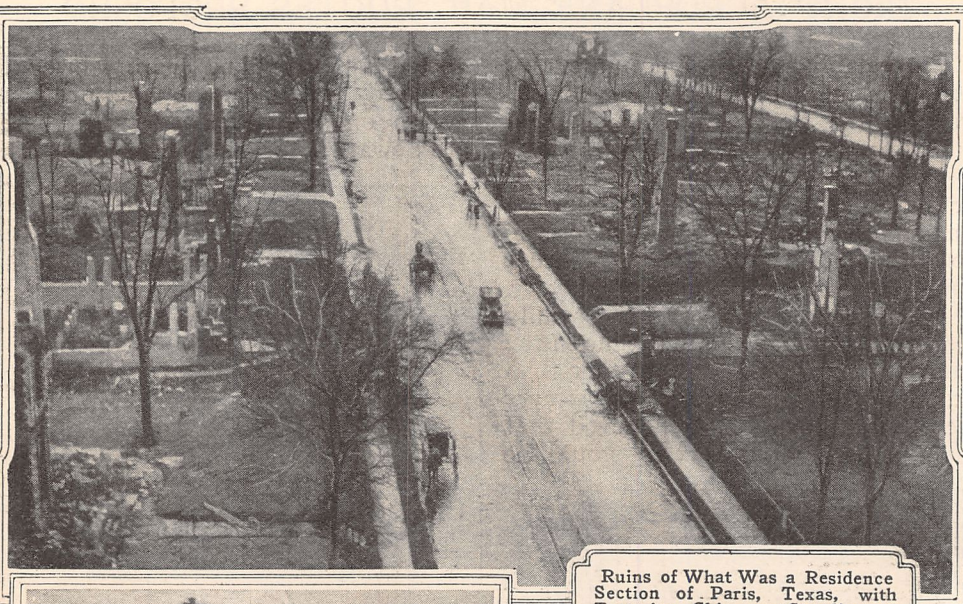
EIGHT AEROPLANE MAIL ROUTES PROPOSED

The establishment of a number of aeroplane mail routes is being considered by the Post Office Department and as an initial step in this direction it is seeking bids for carrying mail by air craft over eight routes, one in Massachusetts and seven in Alaska. Both regions present serious weather conditions at certain times of the year. If these routes can be successfully operated, it will be the first time in the history of the country that other than temporary aerial mail service has ever been maintained. It is believed that a permanent aerial service would be a great stimulus to the development of the nation's aerial defenses.

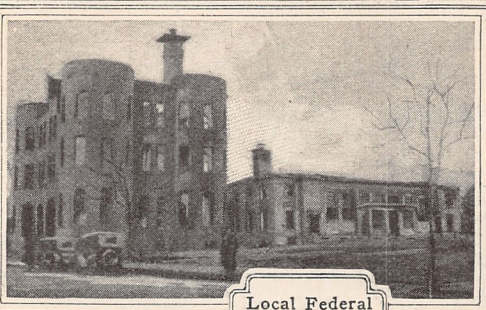


In Massachusetts it is proposed to fly between New Bedford and Nantucket with stops in between; this 112-mile round trip must be made 13 times a week during the warm months and six times a week for the rest of the year. The maximum weight of mail per trip would be 3,000 lb. It is suggested that possibly a hydroplane could be used here. Among the principal points on the seven Alaskan routes are Seward, Fairbanks, and Nome; the routes vary in length from 110 to 380 miles. In some cases trips must be made thrice weekly, and in others only twice. The maximum loads on these routes range from 500 or 1,000 lb. to 1,500 or 3,000 lb., an option being given in each case. At present, several weeks are required to reach some of these Alaskan points, which are the important mining centers in the territory. Bids will be opened May 12; it is proposed to begin service October first of this year. It is known that a number of persons backed by sufficient capital are considering making bids.

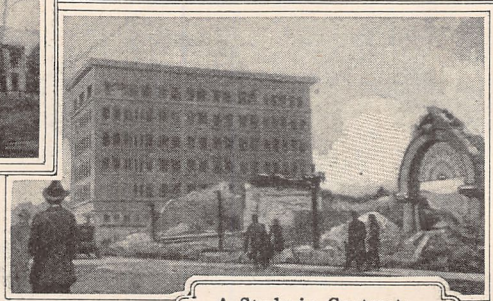
TERRIFIC FIRES SWEEP TWO SOUTHERN TOWNS



Ruins of What Was a Residence Section of Paris, Texas, with Tottering Chimneys Standing as Tombstones in a Graveyard of Hundreds of Homes, as Seen Following the Disastrous Fire of March Twenty-First



Local Federal Buildings Gutted by the Flames, Which Threatened to Raze the Entire Town



A Study in Contrast: A Modern Bank Building Which was Injured, but Not Demolished

Main Street, Principal Business Thoroughfare, in Ruins: The Fire Started in a Warehouse and, Fanned by a Stiff Wind, Swept Away Many Blocks of Buildings

RAZING BUSINESS AND RESIDENCE DISTRICTS

Ten Blocks of Business Structures and Some 600 Dwellings were Wiped Out by a Conflagration at Augusta, Georgia, March 22. A Section of the Residence District in Flames is Pictured Above, While Below, Broad Street, the Principal Thoroughfare, is Shown with the Fire at Its Height. Burning at Left Is 16-Story Empire Life Building, and, before Confederate Monument, 10-Story Augusta Chronicle Building. Many of the City's Oldest Landmarks were Destroyed. Three Thousand Persons were Made Homeless. The Loss is Estimated at $5,000,000

PRISONERS HANDCUFFED TO SUITCASES

A Michigan sheriff has devised a simple way of handcuffing a prisoner so that he can be taken along a public

Instead of Handcuffing This Prisoner to an Officer He is Shackled to a Heavily Laden Suitcase so That Ordinarily the Manacle will Not be Seen

thoroughfare without letting it appear to passers-by that the man in custody really is in shackles. Instead of locking a prisoner to an officer, which arrangement makes the handcuffs rather conspicuous, the prisoner is handcuffed to a heavily laden suitcase which he is required to carry. The suitcase is filled with bricks and weighs from 20 to 50 lb., making escape very difficult.

DELICATE FOCUSING FINDER FOR FOLDING CAMERA

By adapting the principle of the telemeter to the needs of the camera, a focus-finding device has been developed which eliminates guesswork in estimating distances and enables an amateur operator to get properly focused, sharp pictures. The apparatus is applied to an instrument of the folding type and is built into the base of the metal standard that supports the front part of the bellows. Roughly, it consists of three small, rectangular mirrors set at an angle of 45°, and an adjustable prism which when moved up or down causes the bellows to move simultaneously back or forth. Two of the mirrors are mounted in the same plane on one side of the standard, but separated by a distance equal to the width of one of them. The third mirror is on the opposite side of this frame in the same vertical plane, when the camera is turned on its side, as the opening between the other two reflectors. The prism is interposed above the third mirror, so that, in looking down, one's line of vision must pass through it in order to see the mirror beneath. The device is used the same as a range finder. In focusing the camera, a straight line, such as the railing of a porch or the fire wall of a building, must be looked at. The image is reflected in three sections, which may or may not form an unbroken line. If this line is unbroken the camera is properly focused without further adjustment. If, however, it is disjointed, the middle section, for instance, being higher or lower than the two side parts, the lens is out of focus. By turning a screw the prism is then moved until the three lines coincide and the image appears in normal form.

DENMARK COMPANY BUILDS BIGGER MOTOR SHIPS

In connection with the rapidly increasing use of motor ships, it is interesting to note that Denmark is still taking the lead in developing these craft. It was recently announced by a director of one of Copenhagen's large shipbuilding firms that the company is now constructing motor vessels of 12,000 tons. These ships are 500 ft. in length and carry engines that develop 6,000 hp. In contrast to this, the first motor ship, built only a few years ago at Copenhagen, was of 7,000 tons and had a length of 375 ft. Orders for some 50 big motor vessels have been placed with the aforementioned firm.

VILLA'S RAID AT COLUMBUS TOLD PICTORIALLY

Military Funeral of the Seven Troopers of the 13th United States Cavalry Killed during the Border Assault

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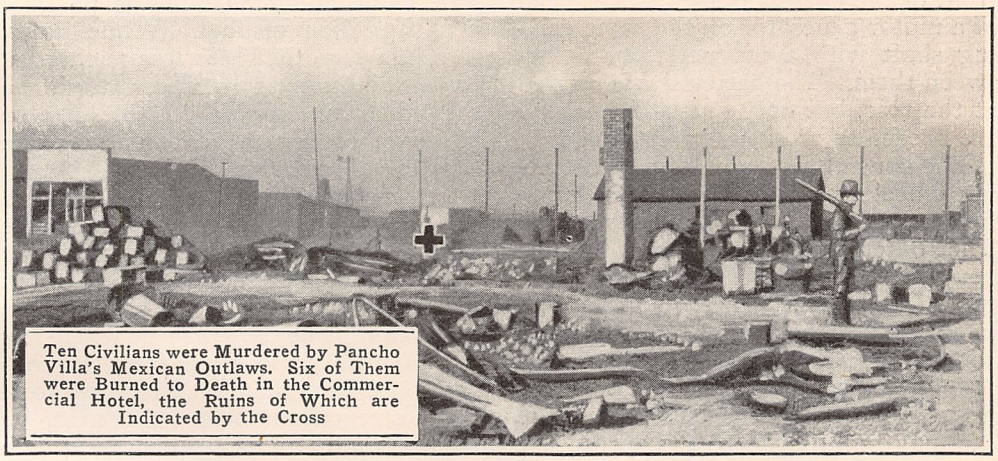
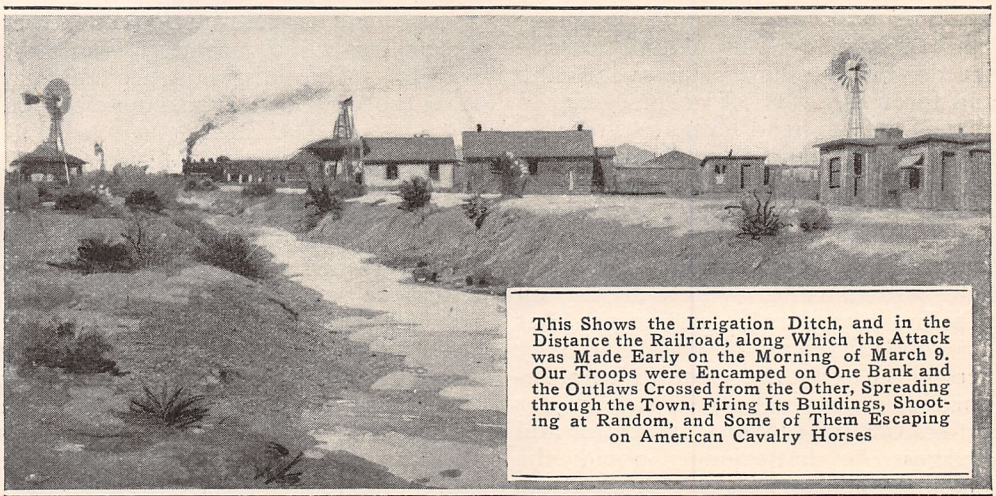


Ten Civilians were Murdered by Pancho Villa's Mexican Outlaws. Six of Them were Burned to Death in the Commercial Hotel, the Ruins of Which are Indicated by the Cross



This Shows the Irrigation Ditch, and in the Distance the Railroad, along Which the Attack was Made Early on the Morning of March 9. Our Troops were Encamped on One Bank and the Outlaws Crossed from the Other, Spreading through the Town, Firing Its Buildings, Shooting at Random, and Some of Them Escaping on American Cavalry Horses

REMARKABLE FEATURES IN NEW DUAL-POWER CAR

What is by far the most radical and interesting development recently carried out in electric-vehicle construction is represented in a new dual-power car that has just made its appearance. In designing the machine an attempt has been made to embody the best features of both the gasoline and electric cars. The result is a truly remarkable vehicle which has the body lines and general appearance of an electric, the speed and touring radius of a gas car, the comforts of both, and the drawbacks of neither.

The power plant consists of a four-cylinder, 14-hp. engine mounted at the front of the chassis immediately ahead of a motor generator on the same driving shaft with a magnetic clutch between them. The batteries are carried at the rear, but only one-half as many are needed as are usually employed.

The control mechanism on the steering wheel resembles that of the gasoline car. There are two finger levers. The outer of these is the electric controller and the inner the engine throttle, which, when moved from neutral, actuates the magnetic clutch, connecting the motor and the engine. A foot brake is provided, but for ordinary driving is not needed, since the car may be brought to a stop quickly and without danger of skidding by dynamic braking. Thus the machine can be started, put through all possible speeds, and stopped with the thumb and forefinger. There are no gears to change and no hand levers to shift.

With this arrangement the car is capable of unusual performances. It can be driven on gasoline power alone, electric alone, or both at the same time. A maximum speed of about 35 miles an hour is attainable. When driving on gasoline, the surplus power, or that developed in excess of what is actually needed to carry the machine at a desired speed, is saved, for the motor automatically becomes a generator and charges the batteries. Should the gasoline supply run short at any time the batteries are good for 30 miles. When a steep hill is to be climbed a driver has the advantage of two forms of motive power. The danger of stalling the car is entirely obviated, for should the engine stop, the motor would instantly begin turning it over at several hundred revolutions a minute. Thus it would not be stalled for as much as a second, if in good condition, and in any event the motor would keep the car moving.

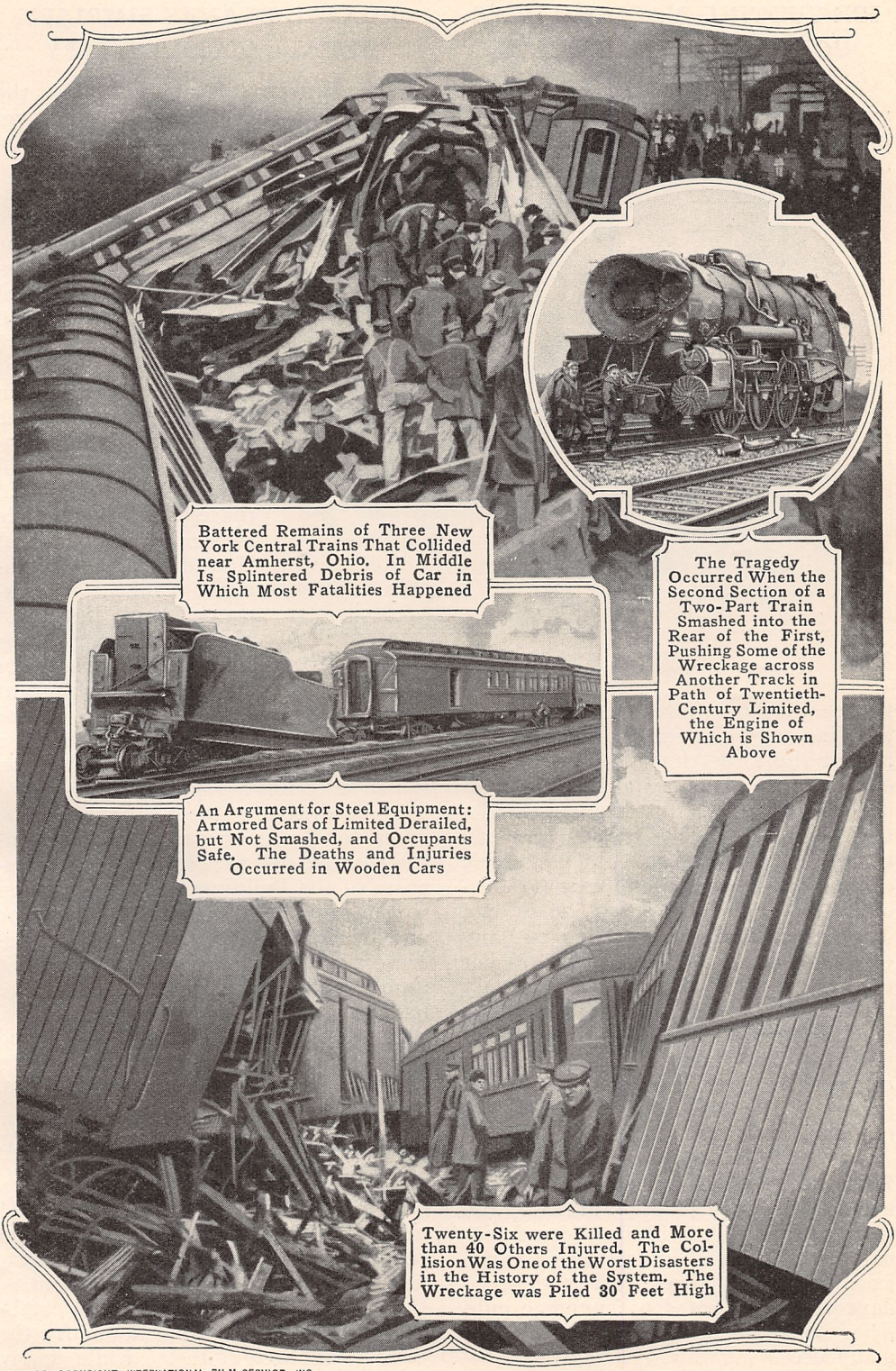
From an economic standpoint the machine is unusual. Road tests have shown that it is possible to get 45 miles out of one gallon of gasoline. For a car of the size and weight of this one, the record at first thought seems incredible. While driving on the engine alone about 30 miles is possible with a gallon of fuel. While doing this, however, the batteries are charged for an additional 15 miles. It will be seen that the trouble and expense of battery charging, present in all electric cars, are absent here.

The weight of the machine is 3,100 lb. as against 4,200 lb. of the electric of which it is an outgrowth. Since the battery space is lessened by half, room is available at the rear to conceal an extra tire. The only way in which the car differs in appearance from the conventional brougham is that the hood has a streamline effect and a neat, V-shaped radiator is provided at the front. It should be understood that there is no transformation of power except that which otherwise would be wasted. This distinguishes the car from those known as gasoline-electrics.

WESTERN DEPARTMENT STORE RETAILS LUMBER

A Portland, Ore., department store has broadened its field by establishing a lumber section where patrons may purchase material in short lengths and small quantities. This innovation was made in order to provide a way for the retail lumber dealers to dispose of odds and ends and use the package-delivery system of the department store, thus reducing the cost of haulage.

NEW YORK CENTRAL TRIPLE WRECK KILLS MANY



Battered Remains of Three New York Central Trains That Collided near Amherst, Ohio. In Middle Is Splintered Debris of Car in Which Most Fatalities Happened

The Tragedy Occurred When the Second Section of a Two-Part Train Smashed into the Rear of the First, Pushing Some of the Wreckage across Another Track in Path of Twentieth-Century Limited, the Engine of Which is Shown Above

An Argument for Steel Equipment: Armored Cars of Limited Derailed, but Not Smashed, and Occupants Safe. The Deaths and Injuries Occurred in Wooden Cars

Twenty-Six were Killed and More than 40 Others Injured. The Collision Was One of the Worst Disasters in the History of the System. The Wreckage was Piled 30 Feet High

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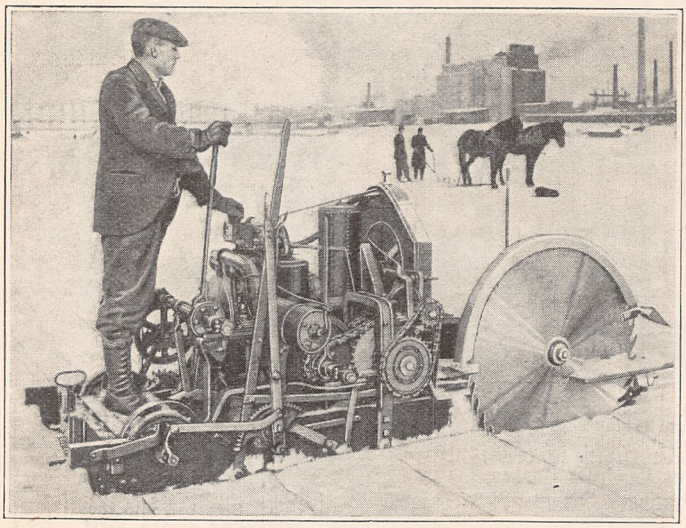
ICE-CUTTING MACHINE DOES WORK OF SIXTEEN TEAMS

A self-propelled ice-cutting machine, which it is claimed will do the work of 16 teams, has been invented by three Wisconsin brothers. A 35-hp. gasoline engine operates a circular saw and at the same time propels the machine across the ice, under the guidance of one man. By means of a friction disk the speed of the machine can be regulated as desired. It is capable of cutting one complete cake per second, or 30,000 cakes per working day. The saw can be adjusted to cut any depth down to 16 in. In ice thicker than that the cakes can be easily broken off with a splitting bar. The machine will work moving forward or backward, can cut on a straight or curved line, and runs under its own power to the place where work is to be done.



This Machine is Run by a 35-Horsepower Gasoline Engine, Is Self-Propelled, and will Cut 30,000 Cakes of Ice per Day

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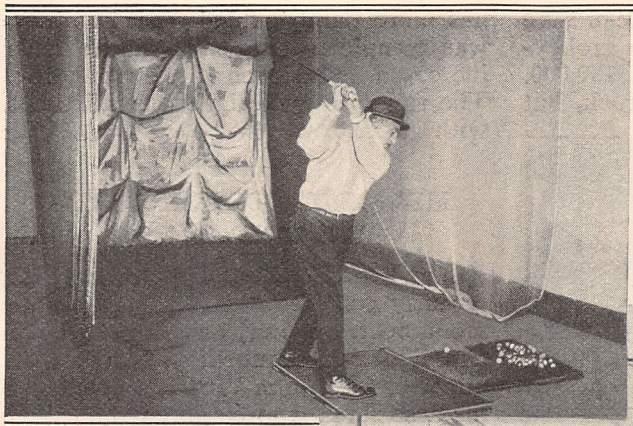
¶Encouraged by the success of "Electrical Prosperity Week" in 1915, the week of Dec. 2-9, 1916, has been designated by electrical interests as "America's Electrical Week." Those seven days will be devoted to intensive publicity relating to electricity and its many uses.

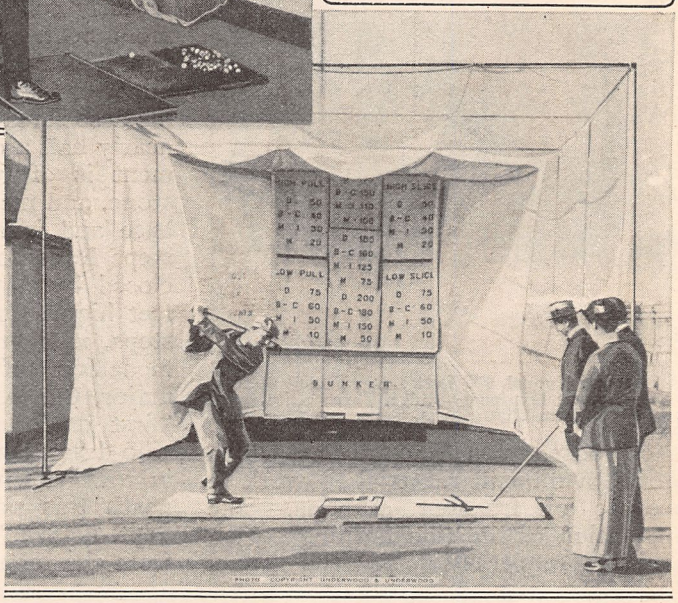
SPECIAL BLANKS SIMPLIFY REVALUATION OF CITY

The bureau of appraisal of the county and city of Los Angeles recently completed a detailed and systematic revaluation of 200,000 buildings within a certain area. The work of gathering the necessary data was expedited by the use of specially prepared blanks, of which there were six different kinds, that contained in condensed form a place for all desired information. The general subjects specified on one of these forms include the following: "class," "foundation," "plumbing," "finish," "occupancy," and "lighting." Each of these heads is subdivided to indicate something important about the grade or equipment of the building. On each blank, also, is a square ruled off to a stated scale on which a contour plan of the building may be drawn. One of these blanks, when filled out, shows at a glance all the data needed to arrive at a fair valuation of the building in question, even to the number of rooms on each floor and the kind of bookcases and refrigerators built into the walls. After the number of square feet in a structure had been computed from the diagram, a unit value per square foot was placed on it by an expert, who was able to work rapidly with the data in this form.

INDOOR GOLF POPULAR GAME IN MANY LARGE CITIES

In a number of the large eastern and middle-western cities indoor golf became a most popular form of recreation during the past winter months. Inside and roof "courses" were established at some of the big hotels for the benefit of their guests, while many





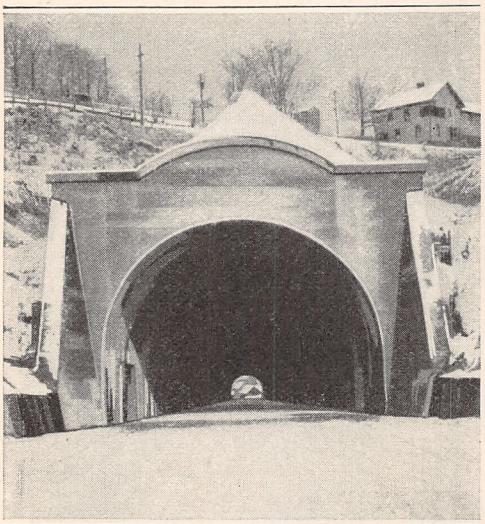
At the Side a Golf Devotee is Practicing at One of the Indoor "Courses" at Cincinnati. Besides Refreshing One Mentally and Physically after a Number of Hours in an Office, the Game Enables a Player to Improve His Skill during the Winter Months and Make a Good Showing When the Season Opens in the Spring. Below, a Prominent Player is Making a Drive into a Net Placed on the Roof of One of New York's Hotels for the Benefit of the Guests

practice "links" were opened in the business districts and conducted much the same as bowling alleys and billiard parlors. They were frequented not alone by title holders and adept enthusiasts, but also by mediocre players and beginners in need of practice and professional coaching. Since the inside game permits a player to drive 300 or 400 balls in an hour or so, giving him more actual club work than he would ordinarily get in several afternoons on a real course, it enables a person to make great improvement in a comparatively short time. And this is one of the particular reasons for its popularity. At Cincinnati some 500 devotees played golf in this way throughout the closed season. The necessary paraphernalia for an indoor "course" are not elaborate. Driving and pitching nets, putting greens, and canvas bunkers usually suffice. The former are made in different forms, the canvas backstops of some having pockets into which the balls fall, these being marked to show the values and characters of different shots; and others being supplied with charts indicating the approximate distance a ball would have gone, whether it was a low slice, a high pull, or a drive out of bounds. The pitching net gives a player practice at mashie shots, for when a ball falls into a sand pit that is provided, it is up to the player to get it out.

TUNNEL PIERCES HISTORIC MISSIONARY RIDGE

Historic Missionary Ridge, near Chattanooga, Tenn., has been pierced by a highway tunnel 933 ft. long. The uneven region, which presented strategic problems to the contending armies of the Civil War, has long presented difficulties in highway construction because of the steep grades involved in getting over the ridge. The tunnel, which was completed three years ago, has a uniform grade of five per cent, whereas the road which it supplanted had a 12-per-cent grade. The bore is 30 ft. wide and 23 ft. high, and is paved

with concrete in which car tracks have been laid in anticipation of a trolley-line extension; the cost was $130,000. The ridge contains no solid rock, but

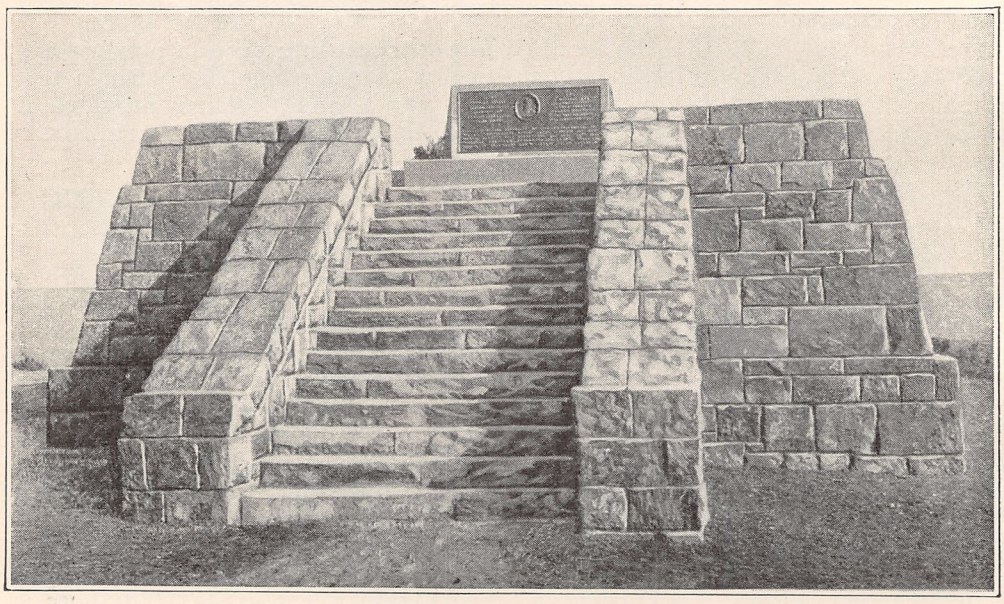


A Highway Tunnel, 933 Feet Long, Which Pierces Historic Missionary Ridge, Three Miles from Chattanooga, Tennessee

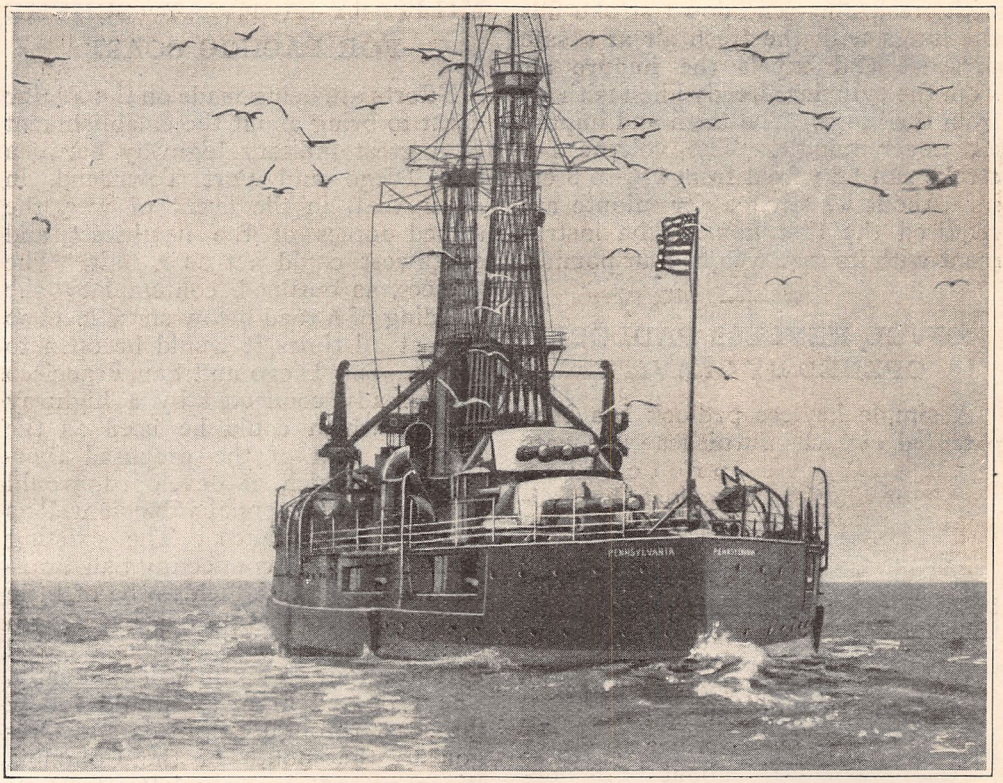
is composed of a kind of clay which proved a difficult material to work in because of frequent cave-ins. The population of the rich farming region made more accessible by the tunnel has more than doubled since the bore was completed, and land values have increased at an even more rapid rate. The tunnel is well lighted at all times with electricity.

MEMORIAL TO EXPLORER OF GRAND CANON

The United States Government has recently completed a $5,000 memorial monument, or altar, on the rim of the Grand Cañon in northern Arizona in honor of Maj. John Wesley Powell and his associates who explored the cañon nearly half a century ago. The monument is of roughly hewn blocks of stone, and measures 21 by 28 ft. at its base and is 18 ft. high. A flight of steps leads to an area at the top inclosed by a stone wall, about three feet high. On this wall, opposite the steps, is a bronze tablet, including a medallion of Major Powell. The major, the inscription states, was the "first explorer of the Grand Cañon, who descended the river with his party in rowboats, traversing the gorge beneath this point Aug. 17, 1869, and Sept. 1, 1872." A fine view is obtained from the monument.



Monument Recently Erected on the Rim of the Grand Canon in Honor of Maj. John Wesley Powell and His Associates, Who Were the First to Traverse the Cañon in Rowboats



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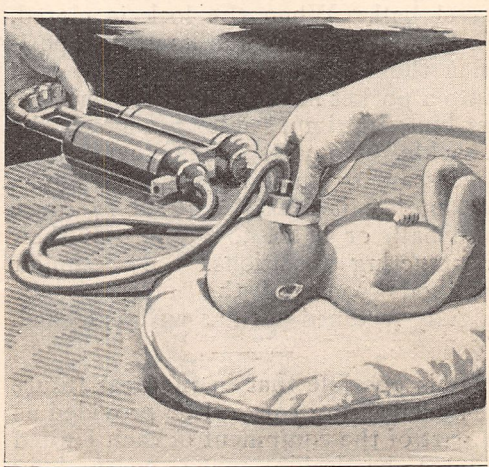
NEW DREADNAUGHT "PENNSYLVANIA" IN TRIALS

STERN view of the "Pennsylvania," America's latest and greatest dreadnaught, during recent trials off the coast of Maine, when hundreds of gulls circled it. The vessel has an overall length of 680 feet, a normal displacement of 31,400 tons, and a designed speed of slightly more than 24 miles an hour. It is the sister ship of the "North Carolina," which should be completed in July, and the first fighter to carry twelve 14-in. guns arranged in threes in superimposed turrets ahead and astern. Its additional armament consists of twenty-two 5-in. rifles and four submerged 21-in. torpedo tubes. Sixteen-inch armor is used amidships. Oil is employed as fuel, and the engines are designed to develop 31,500 horsepower.

RESPIRATOR FOR NEW-BORN INFANTS

An artificial respirator for infants, similar to instruments devised for resuscitating adults, is now coming into use. It is employed to produce artificial respiration in a new-born baby whose breathing is insufficient or wholly lacking. The instrument, which may be clamped to a table, consists of two cylinders with pistons operated by a single handle. A rubber tube leads from each cylinder to a rubber mask held over the infant's nose and mouth. The upward stroke of the pistons draws air from the lungs into one cylinder and fills the other cylinder

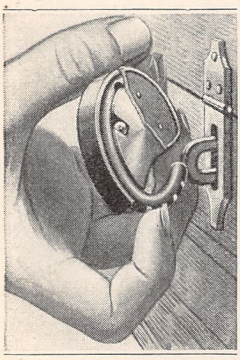


This Instrument is Designed to Produce Artificial Respiration in a New-Born Infant

with fresh air. The down stroke fills the lungs with the fresh air at a safe pressure and expels the impure air from the cylinder already filled with air from the lungs. The fresh and impure air never mingle. The volume per stroke can be varied from 2½ to 8 cu. in. About 60 strokes per minute are required the first hour. The instrument with its case weighs four pounds.

NOVEL KEYLESS PADLOCK OPENED BY GRAVITY

A simple keyless padlock has been patented which furnishes adequate protection against the ordinary unskilled thief. It consists of a body resembling an ordinary padlock, from which projects a shackle, or bail, that describes an arc of about 270 degrees and fits into a semicircular passage in the body of the lock; by sliding the shackle back and forth in this passage the device is closed or opened. Radiating from the semicircular passage are one or more short passages, each of which contains a steel ball. When the lock is closed, or locked, and hangs in its normal position these balls drop by gravity each into a pocket in the side of the shackle, making it impossible to move the shackle. To unlock the device it is necessary to know at just what angle, or angles, it must be tilted to cause the ball, or balls, to drop from their obstructing positions. By similar methods some of the locks can be rigidly fastened open as well as locked.



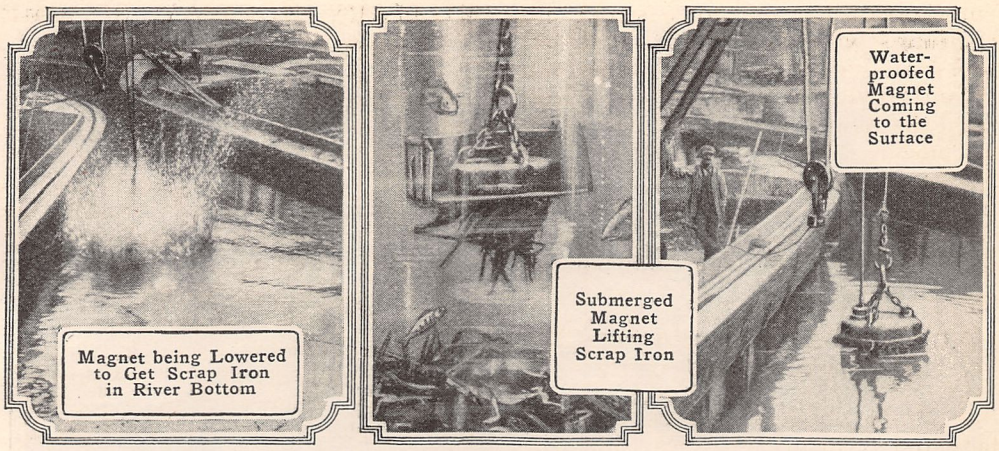
¶It is possible that in the near future a light touring car will be provided as a part of the equipment of each United States battleship when on a long cruise.

MILITARY-HIGHWAY SCHEME FOR PACIFIC COAST

Efforts are being made on the Pacific coast to bring about the establishment of a great military highway between San Diego and Port Townsend, in order that, in the event of war, the armed forces of the northwest and southwest could act as a unit. The project, as outlined, contemplates the building of a road below snow level so that at all times it would be open to traffic. San Diego and San Francisco are already connected by a highway system which could be used as the southern link of the proposed thoroughfare, which, if developed, would have great commercial value as well as strategic importance. The existing Pacific Highway connecting San Francisco and Seattle is held to be of little military worth because it reaches an elevation of 4,000 ft. and is blocked by snow four to six months annually. The proposed highway would follow the coast through California and Oregon to the mouth of the Columbia River, extend along the latter to Portland, then cross into Washington, turning west to the sea and following the coast to the Strait of Juan de Fuca, where it would bend inland and reach Port Townsend. It has been proposed that the road be called the "Balboa Highway." The promoters suggest that the surveys be made by the government and the cost of construction be met with the revenue coming from the sale of timber from forest reservations in the states affected. If this plan were adopted it would devolve upon the counties cut by the road to provide a 100-ft. right of way.

MAGNETS LIFT SCRAP IRON FROM BED OF THAMES

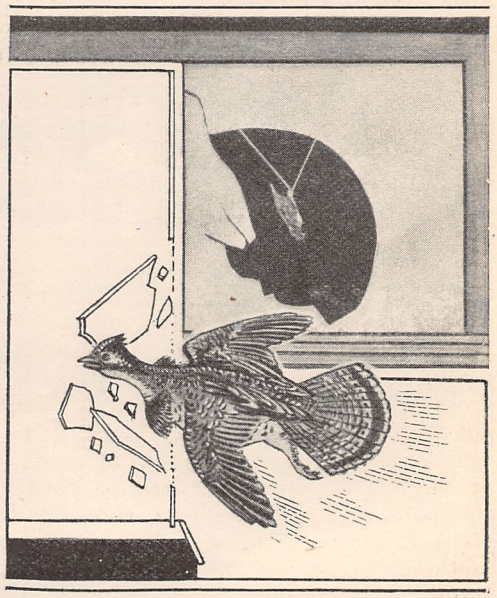
In seeking a method to clear certain portions of the London harbor in the Thames of scrap iron which had accumulated in the river bed for years, electromagnets were employed which speedily did the work that it would



have been costly and perilous for divers to undertake because their diving outfits were liable to be cut by jagged pieces of metal. These magnets and their connections were made waterproof so that when submerged there was no short-circuiting. In one instance a single magnet lifted from the river 250 tons of loose iron and steel in six days. Most of these hoisting outfits employed 36-in. magnets. In lifting large pieces of iron they could control anywhere from 500 to 900 lb. per load; where the pieces were smaller, 300 to 500 lb. was their capacity. Being frequently submerged, the overheating which might otherwise have resulted was avoided. The salvaged iron was alongside docks at which scrap iron had been handled for many years. The pieces which accidentally fell overboard made piles so high that finally they scraped the bottoms of vessels and their removal became imperative.

PARTRIDGE MEETS DEATH BY FLYING AGAINST WINDOW

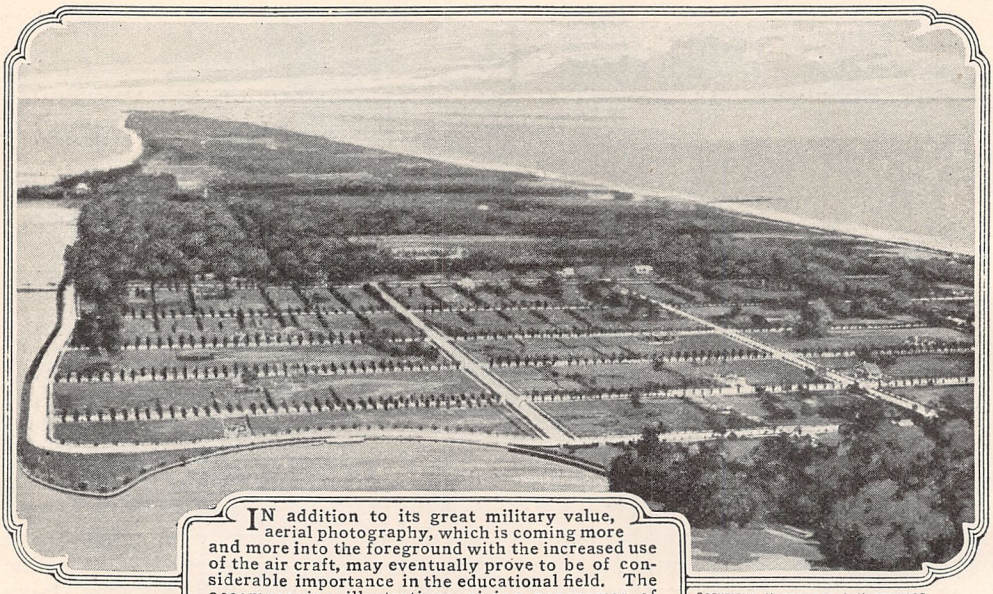
The astonishing swiftness and force with which birds fly was strikingly illustrated when a partridge crashed through a large window in a country residence near Red Wing, Minn., recently. The window was glazed with plate glass, ¼ in. thick. The bird, which weighed 20 oz., was found dead in the living room 11 ft. from the window. The impact of its body broke a hole in the heavy glass about three feet in diameter. This window is more than five feet square and close to the ground. It overlooks a large lawn which at certain times of the day is very vividly reflected in the glass. It is thought that the bird was deceived by the reflection and supposed it was



This Plate-Glass Window, One-Fourth of an Inch Thick, was Shattered When a Partridge Flew against It and was Killed

flying through an opening when it met its death. All but two or three very small pieces of the broken glass were thrown into the room.

EDUCATIONAL POSSIBILITY OF AERO PHOTOGRAPHY



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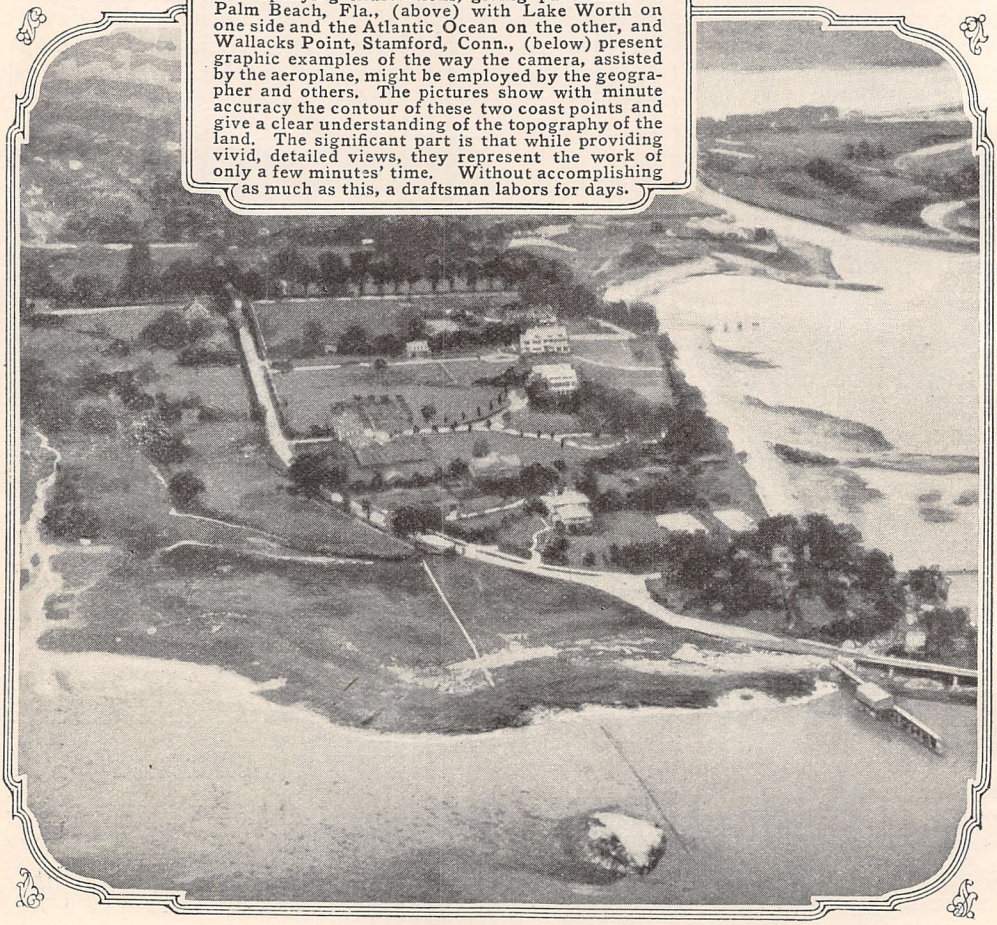
IN addition to its great military value, aerial photography, which is coming more and more into the foreground with the increased use of the air craft, may eventually prove to be of considerable importance in the educational field. The accompanying illustrations, giving panoramas of Palm Beach, Fla., (above) with Lake Worth on one side and the Atlantic Ocean on the other, and Wallacks Point, Stamford, Conn., (below) present graphic examples of the way the camera, assisted by the aeroplane, might be employed by the geographer and others. The pictures show with minute accuracy the contour of these two coast points and give a clear understanding of the topography of the land. The significant part is that while providing vivid, detailed views, they represent the work of only a few minutes' time. Without accomplishing as much as this, a draftsman labors for days.



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FRENCH GUNNERS DESTROY RAIDING AIR CRAFT

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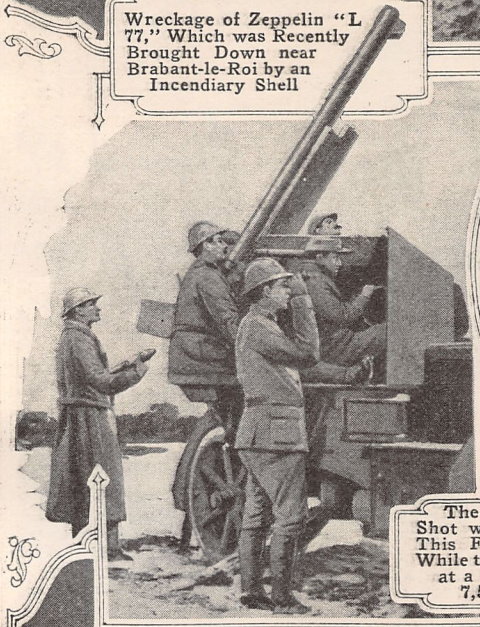
Wreckage of Zeppelin "L 77," Which was Recently Brought Down near Brabant-le-Roi by an Incendiary Shell



The Decisive Shot was Fired by This French "75" While the Craft Was at a Height of 7,500 Feet

Remains of a German Aeroplane Felled "Somewhere in France." The Engine Was in Good Condition after the Fall

Flames Enveloped the Airship as It Plunged to Earth. Later a Morbid Touch of Romance was Added by the Discovery in the Debris of the Slender Feet of a Woman Trimly Clad in Kid Boots

ITALIAN WOMEN CARRY SHELLS TO ALPINE GUNS

One of the Many Ways in Which Girls and Women are Helping the Italian Soldiers in Their Sanguinary Campaign against the Austrian Forces is Illustrated Herewith. The Picture Explains How Artillery Ammunition is Carried to Some of the Nearly Inaccessible Mountain Positions. The Heavy Shells are Lugged in Baskets Strapped to the Backs of the Women, Who Often Form Almost Continuous Processions along the Rugged Alpine Paths

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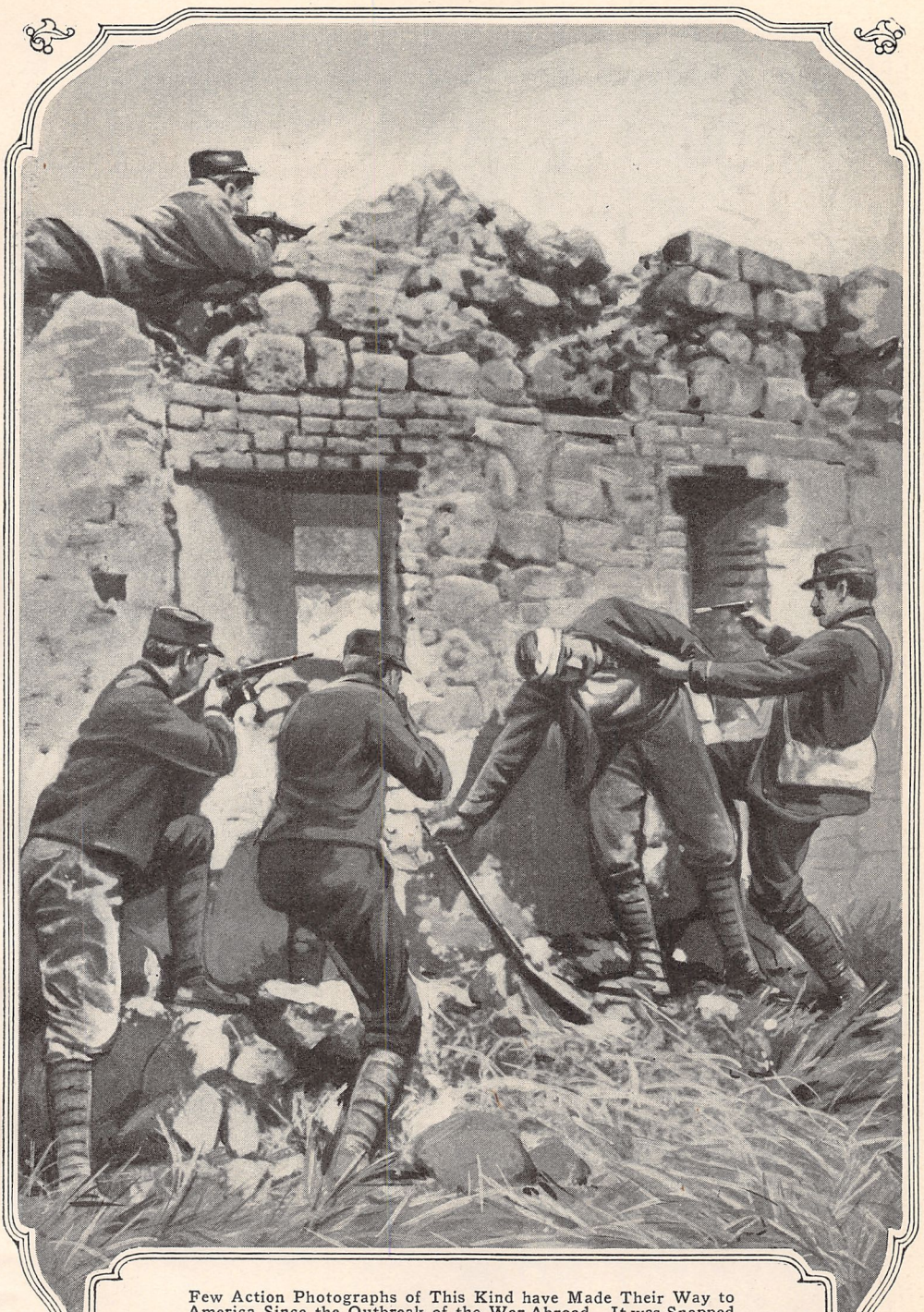
CLOSE-UP VIEW OF ACTUAL FIGHTING IN WEST



Few Action Photographs of This Kind have Made Their Way to America Since the Outbreak of the War Abroad. It was Snapped by a Stretcher Bearer with the Allied Forces during the Heat of an Attack and Shows a Group of French Fighters Engaged at Close Quarters with the Enemy

CHALK-WHITE TRENCHES IN CHAMPAGNE REGION

Contrary to the First Impression One Gets upon Glancing at the Accompanying Photograph, the Trench Extending Far into the Background is Not Lined and Bordered with Snow. Its Appearance Is Due to the Chalky Character of the Clay in This Part of the Champagne Region. The Zigzag Excavation Ahead Is a Communication Trench through Which Masses of French Troops are Pushing to the Firing Line

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POISON GASES IMPERIL TROOPS AND CIVILIANS

Pupils of One of the Primary Schools at Rheims Wearing Respirators to Protect Themselves against the Asphyxiating Gases Blown Back from the Battle Lines

Hundreds of School Children and Other Non-combatants Don Masks of this Type

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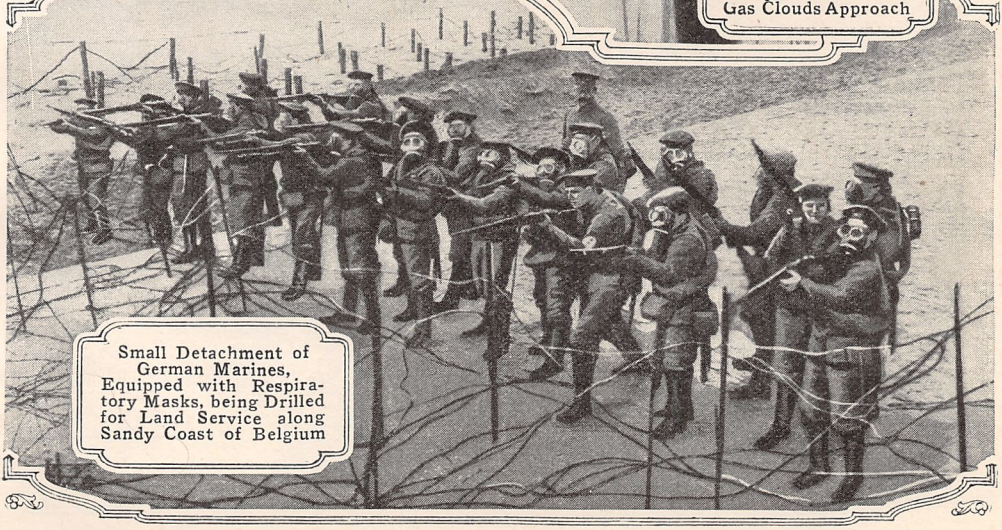
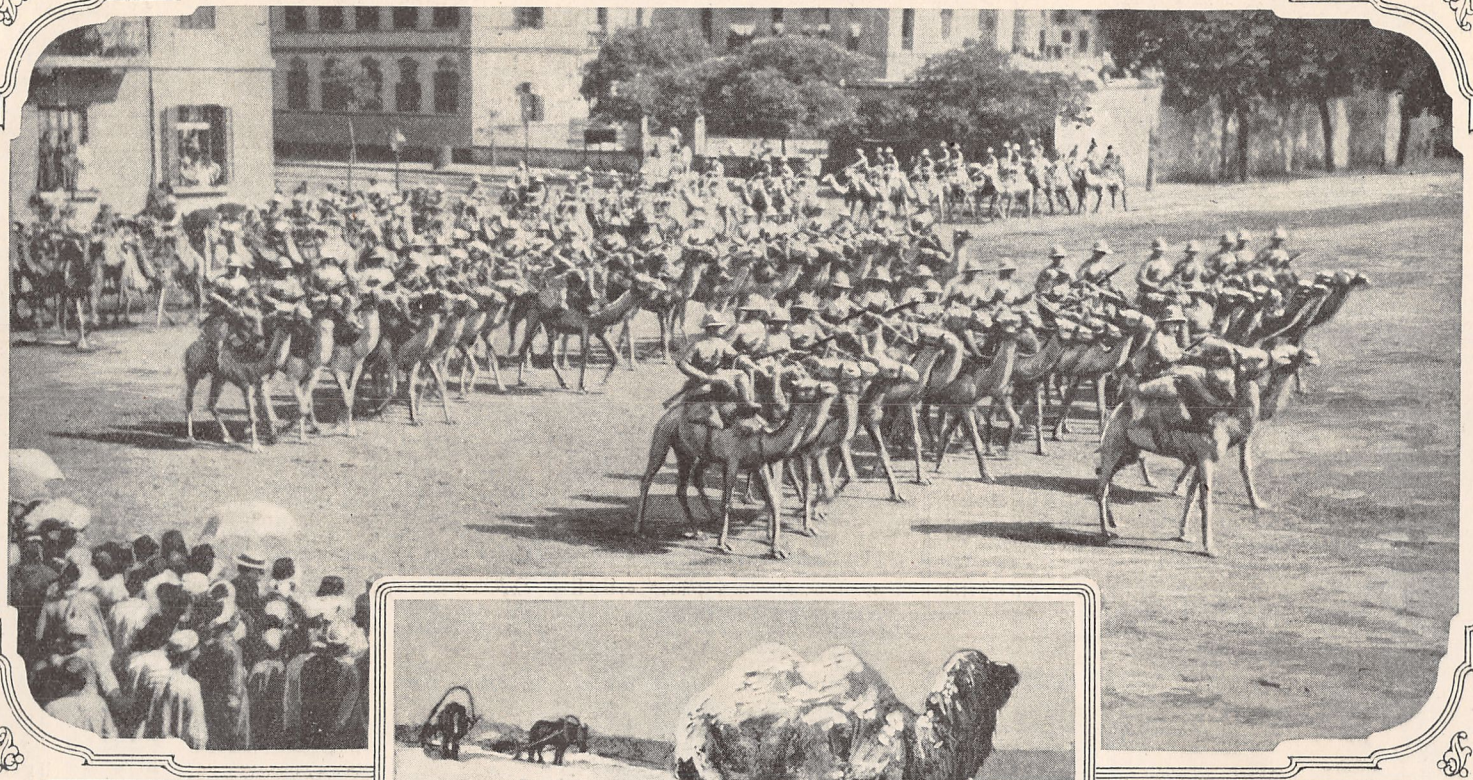
In Many Villages Families Are Supplied with Respirators and the Community Warned When Gas Clouds Approach



Small Detachment of German Marines, Equipped with Respiratory Masks, being Drilled for Land Service along Sandy Coast of Belgium

WAR CAMELS WORK ON DESERT AND SNOW FIELDS



Above, an English Camel Regiment is Shown Leaving Cairo to Guard the Suez Canal against Seizure by the Enemy. Should the Central Powers Be Able to Move a Strong Turkish Force across That Waterway, British Control in the East would be Seriously Threatened

Left, One of Many Camels Used on the Snow-Packed Fields of Russia. Owing to the Lack of Adequate Railway Facilities the Czar's Army has been Greatly Hampered throughout Its Campaign and This Picture Throws a Significant Light on the Situation

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SCENES IN FRENCH TRENCHES AT THE FRONT

French Troops Intrenched Outside of Saloniki. The Steel Rods Visible above the Parapet are Used to Hold the Bags in Place

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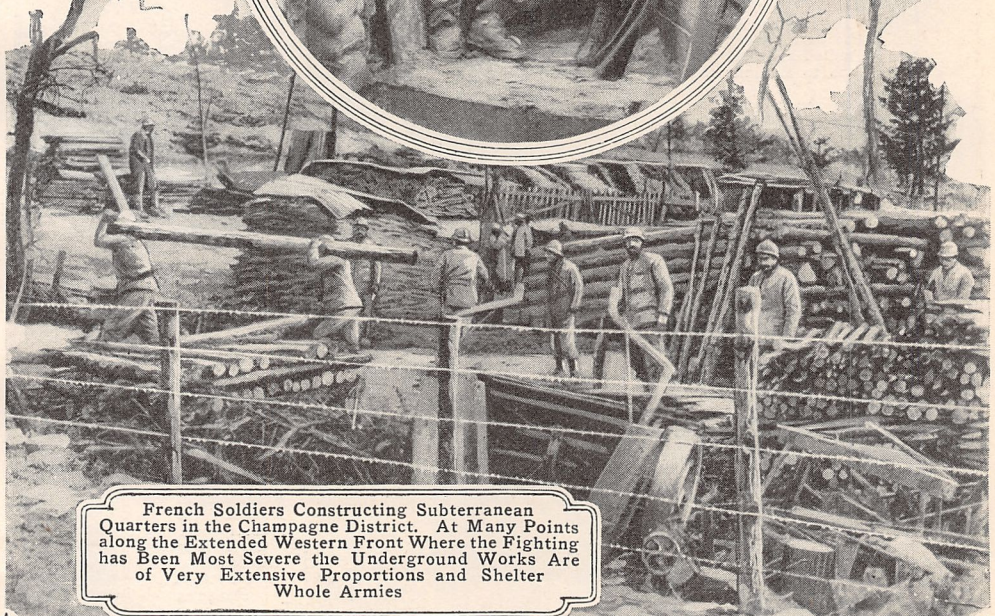
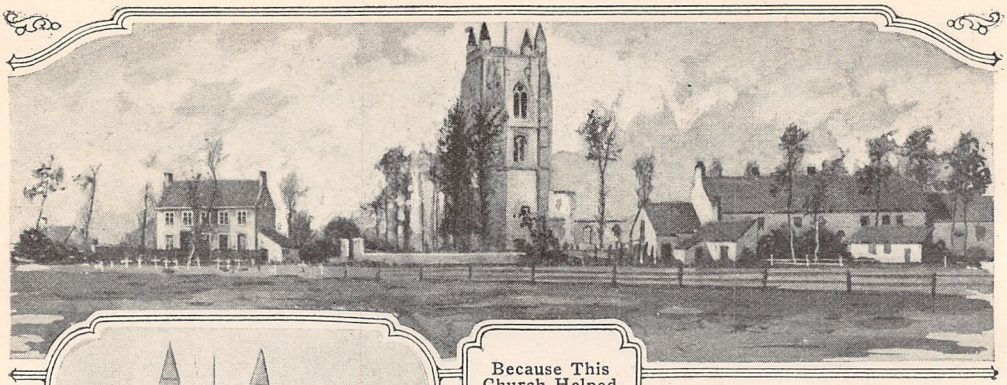
Serving Soup in a First-Line Trench: The Big Boots Worn by the Seated Soldier Protect His Feet from Freezing When Standing for Hours in Mud and Water



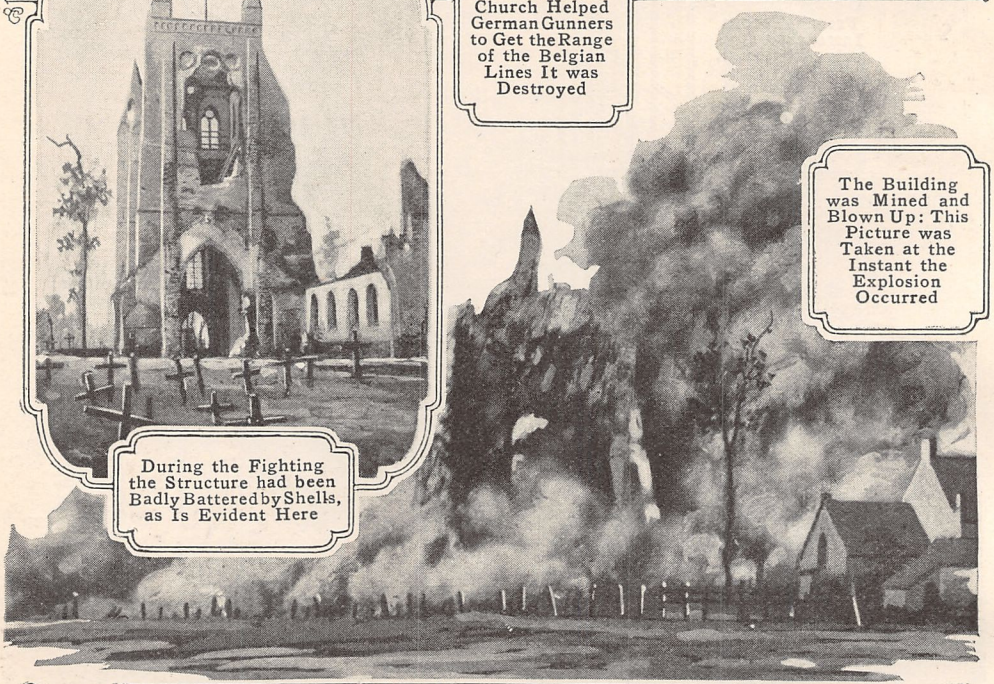
French Soldiers Constructing Subterranean Quarters in the Champagne District. At Many Points along the Extended Western Front Where the Fighting has Been Most Severe the Underground Works Are of Very Extensive Proportions and Shelter Whole Armies

OLD BELGIAN CHURCH RAZED TO THWART ENEMY



Because This Church Helped German Gunners to Get the Range of the Belgian Lines It was Destroyed

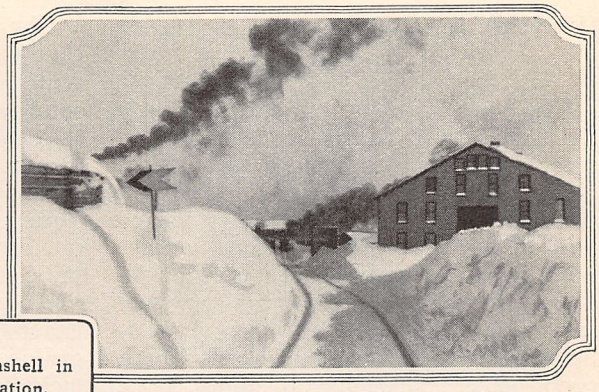
During the Fighting the Structure had been Badly Battered by Shells, as Is Evident Here



The Building was Mined and Blown Up: This Picture was Taken at the Instant the Explosion Occurred

All That Remained of the Edifice after Its Destruction by the Military Authorities for Strategic Reasons

A Clamshell in Operation, Devised Especially for Removing Snow



Clamshells were Used in Cutting This Path through Snowdrifts in Northern Michigan

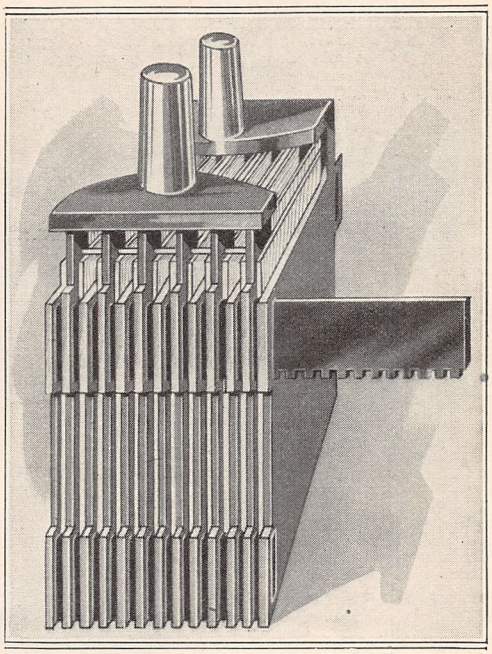
RAILROADS USE CLAMSHELLS TO SHOVEL SNOW

In clearing their right-of-ways through the great snowdrifts of northern Michigan during the past winter the railroads and mining companies in the vicinity of Calumet employed steam shovels and large clamshells operated on traveling derricks. The clamshells were devised by an employe of a mining company for the special purpose of handling snow. One of the enormous shells takes a bite 16 ft. wide and 5 ft. deep and operates on an arm having a sweep of 40 ft. It does the work of 100 men. In many places the snow was 8 and 10 ft. deep.

NEW DEVICE HOLDS PLATES IN BATTERIES APART

A new feature for batteries used in automobile self-starters, etc., which it is claimed doubles the life of the batteries, consists of a device for keeping the plates in the cells apart. Each battery is composed of series of alternating positive and negative plates immersed in acid and separated only by very thin mats, generally of wood. If the plates touch, through deterioration or softening of the mats, the resulting short circuit renders the cell useless.

In the new batteries the wooden mats are supplemented by four notched strips of hard celluloid. Slits in the four corners of each plate permit these strips to be inserted through the openings. By means of the notches in the edge of the strips the plates are locked rigidly apart and remain in that position regardless of the condition of the



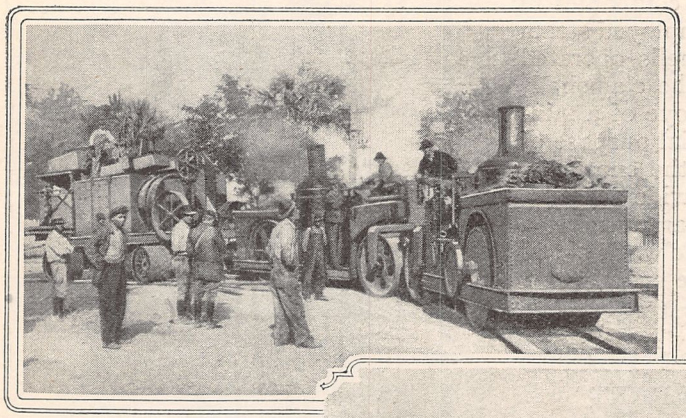
Notched Strips of Celluloid in This Battery Hold the Positive and Negative Plates Apart, Thus Preventing the Short-Circuiting Which Results When Softened Mats Allow Them to Touch

mats. The celluloid members can be removed only by removing the series of plates from the cell.

HIGHWAYS BUILT WITH SAND IN FLORIDA

The man who built his house upon the sand would rub his eyes if he saw some of the country roads in Florida. The composition of the roads is almost entirely sand, for with all her varied natural resources, stone and gravel are not found in many places in Florida. Freight rates are very high, which makes the shipment of ordinary road-building rock material from the North prohibitive. Various attempts have been made to mix oil and other materials with sand, which is obtainable throughout the state. None of these efforts have been entirely satisfactory.

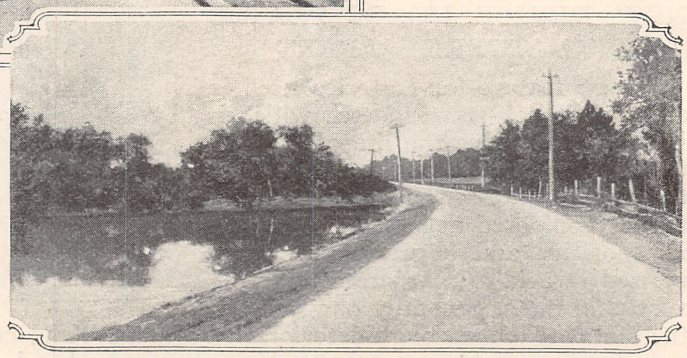
About two years ago an experienced northern road engineer began experimenting with asphalt and sand and has worked out a method which produces a most pleasing result, and which, if it stands the test of time, as seems highly probable, will work a revolution in road building in the state. The six inches of foundation are laid with clay, where obtainable, or made of shell, which is well rolled. The sand and asphalt are then put on hot after mixing in a rotary heater. This has been done before, however without success.



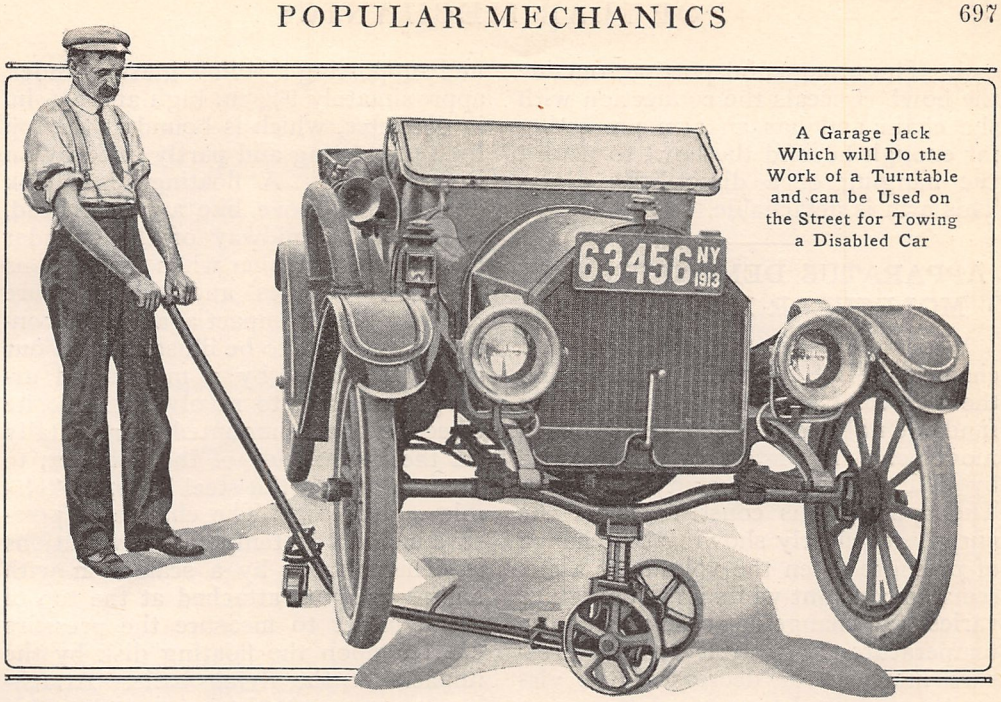
The Road is Given a Clay Base When Possible and Surfaced with a Special Mixture of Asphalt and Sand, Applied Hot and Rolled

The discovery consists in the fact that very few natural sands, as found, will bind permanently. To provide sand which will bind, it has been found that there must be a definite proportion of coarse, medium, and fine sands, and these proportions are a trade secret. When a natural-sand supply is decided on, repeated tests are made to determine its exact proportion of coarse and fine grains, and any variance from exact requirements of coarse or fine grains is remedied by addition of the lacking size, which is secured by screening. These screenings are then added to and mixed with the mass in a mixing machine. After spreading, the asphalt surface is rolled with a steam roller. The working outfit is quite extensive, one machine weighing 21 tons. In a comparatively short time after completion this heavy machine travels over the asphalt-sand road without injury to the road, and constitutes as severe a test as the road is likely ever to sustain, as there is little of the heavy trucking common in the North. How long roads built in this manner will last remains to be demonstrated. The builder believes 15 years a conservative estimate.

The universal presence of sand in the state, and the fact that the asphalt-sand roadway can be built at a little more than



Stretch of Sand-Asphalt Turnpike Extending through Rural District in Florida. This Type of Highway Presents a Good Appearance, but the Length of Its Life Is Yet to be Determined



A Garage Jack Which will Do the Work of a Turntable and can be Used on the Street for Towing a Disabled Car

one-half the cost of brick highway, with the further great advantage of never being subjected to a heavy frost, make the method particularly adaptable to this region.

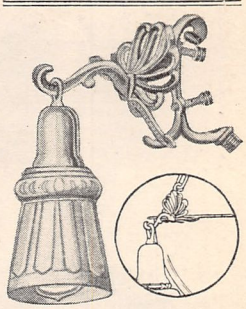
Florida is now wide awake to the value of good roads, and county after county is voting a million dollars each to secure them. Several hundred miles are already finished, and in the very near future the state will afford a winter paradise for the motor tourist within short and easy motoring distance of three-fourths of the entire population of the country.

JACK AND TOWING TRUCK FOR AUTOMOBILES

A combination jack and towing truck for automobiles has been invented which consists of two 10-in. iron wheels supporting a lifting post and drawn by a long bent handle which has a wheel on a swivel near its bend. A lever for raising and lowering the post, about 30 in. long, projects from the jack parallel with the handle. To raise a car the jack, previously adjusted, is rolled under the axle with the curved end of the lever turned up. By pressing this down the axle is raised so that if desired the low-lying handle can be drawn back under the wheels. The device can easily be made to do the work of a turntable. For towing a disabled car on a thoroughfare a straight handle is substituted and a special top and clamp are fastened to the post by which the axle is held firmly in position.

CLAMP ADAPTABLE TO ANY INDIRECT-LIGHT BOWL

A clamp that is adapted to hold almost any style of indirect-light bowl consists of a clamp arm and an ornamental portion adjustably fastened to it. There are two screws on the arm inside the bowl. By means of these the clamp and ornamental portion are drawn tightly about the lip of the bowl. The upper end of the arm forms a hook which fastens to a supporting chain; a light socket is located at the lower

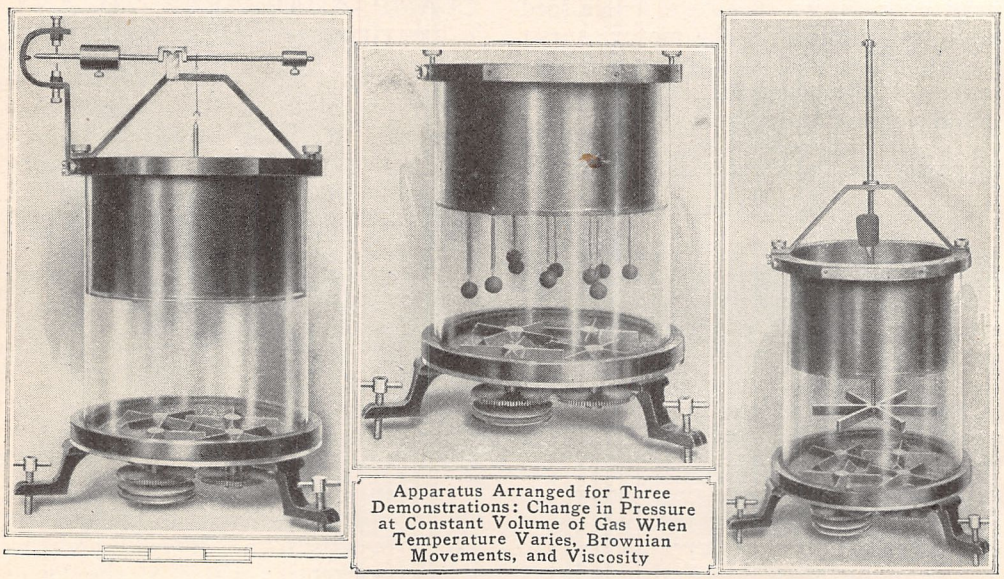


end. The ornamental portion, outside the bowl, conceals the connection with the chain and has an arm projecting far enough beyond the bowl to permit the hanging of a direct-light globe. This arm is detachable.

APPARATUS DEMONSTRATES MOLECULAR MOVEMENTS

What is claimed to be the only mechanical device for visibly illustrating the molecular motion of gases and the fundamental laws governing such movements, has lately been developed by a Princeton University physicist. The apparatus is constructed for the purpose of clearly showing the change of pressure when the volume of a gas remains constant while its temperature varies; the change of volume when the temperature of a gas at a constant pressure increases or decreases; the viscosity of gas; the so-called Brownian movements, an irregular motion of small particles suspended in a gas, and other phenomena.

The molecules of gas are represented by some 16,000 steel spheres, each 1/16 in. in diameter, which are kept in motion by mechanical means within the apparatus. The latter has a cylindrical metal base resting on leveling screws and supporting a hollow glass cylinder, approximately 9¾ in. high and 8½ in. in diameter, which is bound at the top by a metal ring and partly lined by an iron cylinder. A floating glass disk arranged to move like a piston head, is suspended midway of the cylinder from a cross member when the motions of gas molecules and the pressure caused by their impact against the container walls are to be illustrated. Four rotators, driven by a motor and arranged in pairs to revolve in opposite directions, are mounted horizontally on the base inside of the cylinder, to give motion to the steel balls, or "visible molecules." The change of pressure incident to temperature variations is demonstrated by a scale arm with sliding weights attached at the top of the cylinder to measure the pressure exerted upon the floating disk by the impacts of the flying balls. Attachments are provided to accurately regulate the speed of the rotators. The balls are uniformly distributed and their velocity bears a definite relation to the speed of the rotating members. Since by increasing the rate of the latter the velocity of the balls is advanced, the variation of it amounts to the same as varying the temperature of a gas.



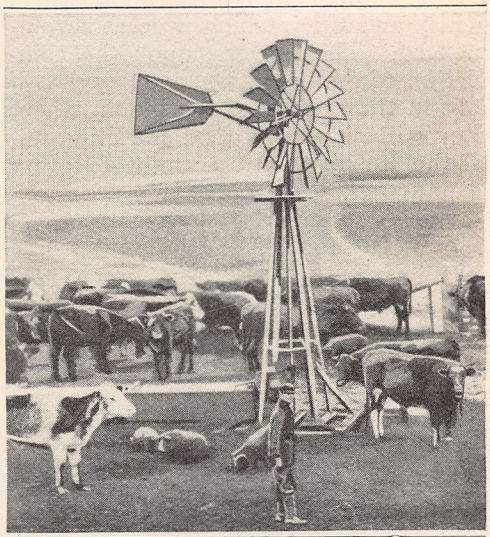
Apparatus Arranged for Three Demonstrations: Change in Pressure at Constant Volume of Gas When Temperature Varies, Brownian Movements, and Viscosity

When the viscosity of gas is to be illustrated the glass disk is replaced by a steel one held in a fixed position at the lower end of the metal cylinder. Suspended from a rod passing through the center of the disk is an iron hub having six spokes. To give inertia to the system the top part of the rod on the upper side of the disk passes through another and heavier disk. The whole system is suspended on a wire so that it can be given an oscillatory motion about a vertical axis. These oscillations are made distinctly visible by an index, and when once started the system will continue to move for some time without noticeable decrement, providing the metal balls, or "visible molecules," and their rotators are at rest. When the latter are started, however, causing the cylinder to become filled with flying balls, the oscillations quickly cease. This demonstrates what takes place when the oscillations of a disk suspended in a gas decrease in amplitude because of the viscosity of the gas.

In demonstrating the phenomena of the Brownian movements a hub with ten spokes of various lengths is fastened to the under side of the aforementioned disk. From each of the arms a wooden ball is suspended on a light coil spring. When motion is given to the "visible molecules" by the rotating wheels, they strike the suspended wooden balls—representing particles floating in a gas—and cause them to move about irregularly.

PORTABLE WINDMILLS USED ON WESTERN FARMS

In sections of Missouri and other farming communities where a certain amount of stock is raised and water is available at depths of 10 or 20 feet beneath the surface of the ground, portable windmills are coming into quite common use. The steel towers of these are mounted on wooden skids, so that they may be moved from one point to another without trouble, and range from 10 to 12 feet in height. When it is desired to change a feeding yard, the pump is removed, the pipe drawn out, and the windmill taken to the new location, where the pump is reinstalled. Outfits of this kind are also being used

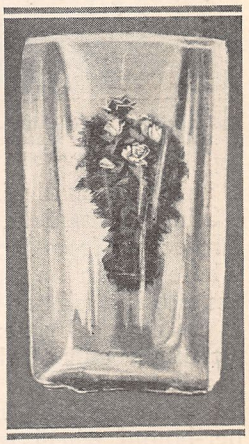


The Windmill is Mounted on Skids and may be Moved from One Point to Another without Difficulty

by threshing crews in some districts in preference to hauling water in tank wagons.

FLORIST DISPLAYS FLOWERS IN BLOCKS OF ICE

Bouquets of roses, carnations, and chrysanthemums frozen in large cakes of ice, formed an exhibit of a Missouri florist at an agricultural conclave held in that state not long ago. The idea was also carried a step farther by another exhibitor who displayed wheat, oats, barley, and corn in a similar manner, arranging the grain in layers. In doing this, a block of ice is frozen part way through and then removed from the can. The water filling its



core is then emptied and the flowers, or whatever is to be used, are placed in the hollow space in the middle. When they are arranged in the proper position water is poured about them gently and the freezing process recommenced. The flowers, upon the completion of the operation, are frozen solidly in the middle of the block, where they will remain in good condition until the ice melts away.

MECHANICAL FAN OPERATED BY HAND

A mechanical hand fan, having four blades constituting a wheel about 5 in. in diameter and fastened to the end of

By Turning the Wheel under the Thumb the Radiating Blades of This Mechanical Fan can be Made to Revolve Rapidly

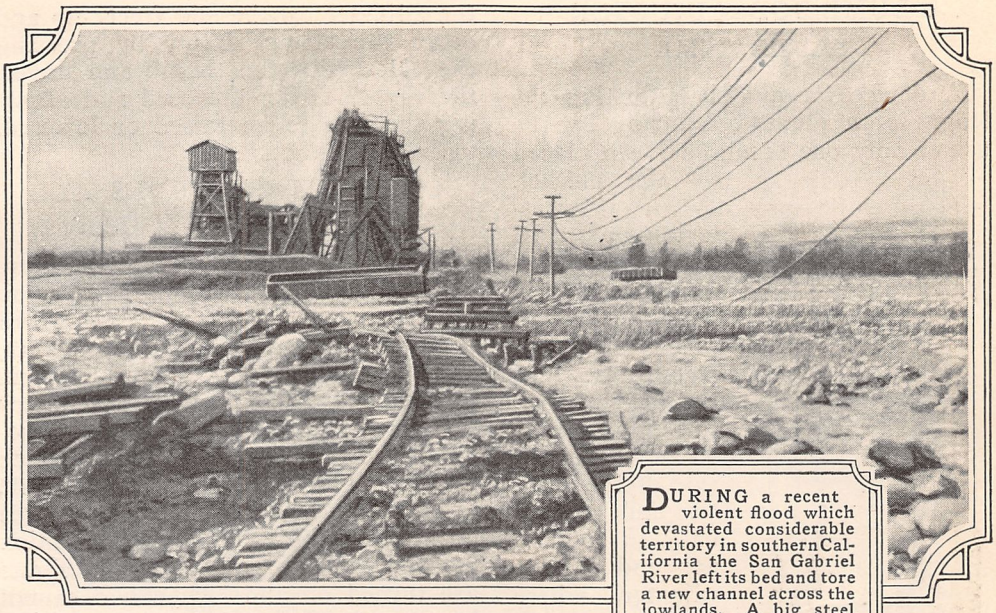
a suitable handle in which is the operating mechanism, has been patented. Projecting from the side of the handle, where it can be easily turned by the thumb, is a rubber-bound wheel. This is connected by gearing with a shaft. At either end of the shaft is beveled gearing, that at the upper end connecting with the fan. By turning the rubber-bound wheel with the thumb the fan is made to revolve rapidly, throwing a breeze in any desired direction.

EARTHQUAKES NOT MENACING PANAMA WATERWAY

Contrary to the popular impression, there is no evidence to substantiate the theory that the Panama Canal is in danger of eventually being ruined by earthquakes. The relation between geologic and topographic conditions and some of the engineering problems encountered in the construction of the waterway form the subject of a bulletin lately issued by the Bureau of Mines, in which this point is considered. Investigation has shown that during the last 300 years there have been but two seismic disturbances of consequence in the region, and that neither of these were of sufficient force to seriously damage the most delicate parts of the now existing canal. The tensile strength of the rocks in the zone is low and would prevent any great accumulation of stress, it is believed. Outside of the isthmian shore waters the ocean bottom has been sinking for years. This has been the chief cause of the earthquakes, each of which has brought about a slight uprise of the land mass. There is a record of four oscillations and the beginning of another elevation, according to the government, but the average uplift for the past 1,000 years is estimated at less than .03 ft. annually, which is too slight to justify concern. It is also stated that the reason for the trouble encountered with slides has been chiefly due to structural breaks caused by oversteep slopes at points where the banks were high and the rocks weak. The remedy has been to remove the unbalanced pressure and lessen the slopes. It is interesting to note that these slides have made it necessary to excavate some 30,000,000 cu. yd. more earth than was first estimated as necessary at Gaillard Cut, formerly known as Culebra.

¶ That Yale's rowing crews might have a clear practice course, dynamite was used this spring to clear the Quinnipiac River of ice.

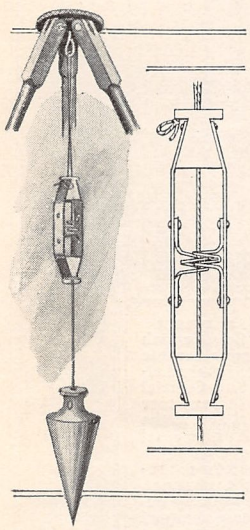
SWOLLEN CALIFORNIA RIVER LEAVES ITS CHANNEL



DURING a recent violent flood which devastated considerable territory in southern California the San Gabriel River left its bed and tore a new channel across the lowlands. A big steel bridge, wide enough to span the flood had it remained in the channel, was left high and dry because the stream changed its course. The most damage was done to the Santa Fe railroad. Gondola cars loaded with sand, used to weight the track, were swept away with a 600-ft. section.

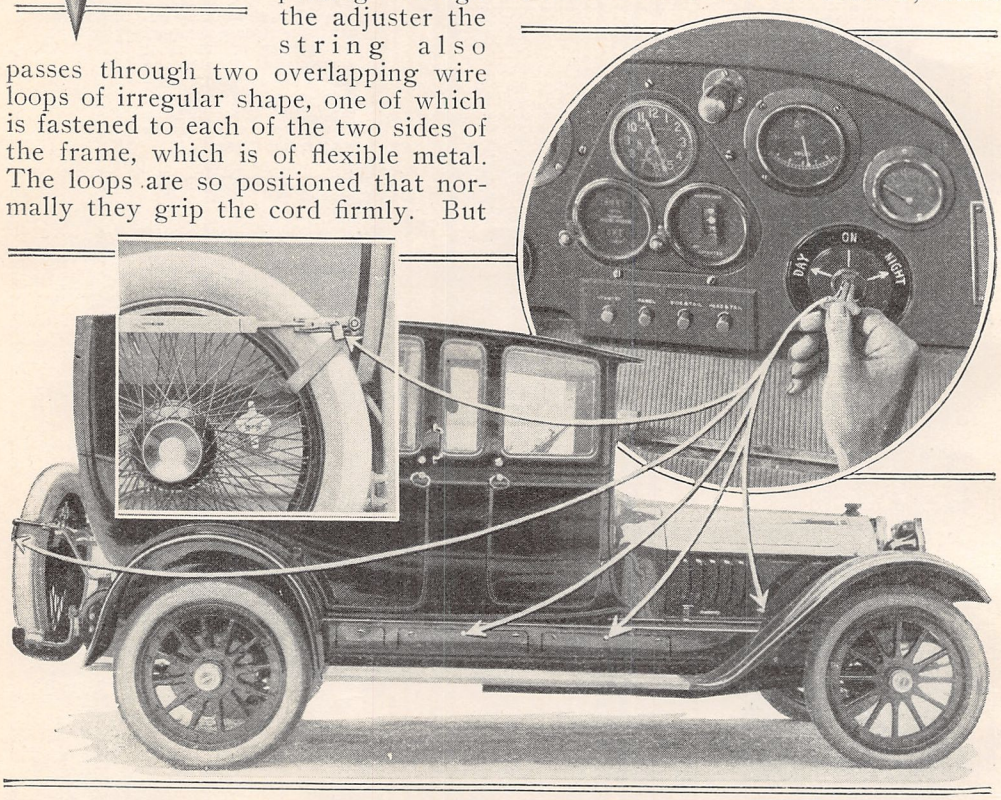
PLUMB-BOB ADJUSTER SAVES TIME

A device for quickly adjusting the length of a plumb-bob string by the use of only one hand, has been placed on the market. When this attachment is used the string extends from the bob up through the simple framework of the device, then through an eyelet on the under side of the transit and thence back to the upper end of the adjuster, where it is tied. In passing through the adjuster the string also passes through two overlapping wire loops of irregular shape, one of which is fastened to each of the two sides of the frame, which is of flexible metal. The loops are so positioned that normally they grip the cord firmly. But the adjuster can be slid freely up and down the string simply by pressing the sides with the thumb and finger, thereby releasing the cord and allowing the bob to be raised or lowered.

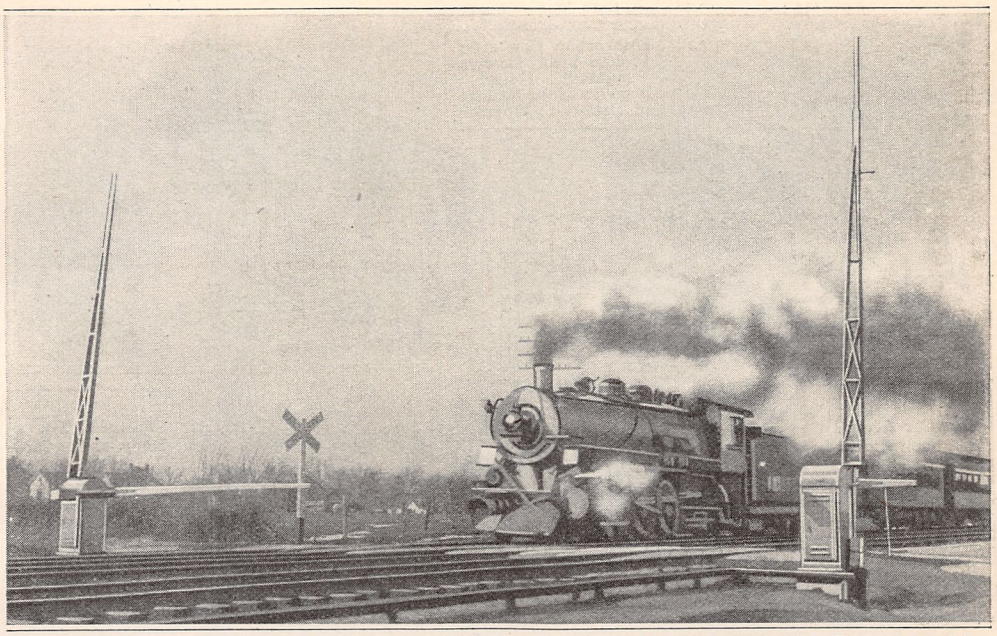


ONE KEY CONTROLS ALL PARTS OF NEW CAR

The latest model of one of the more expensive makes of automobiles is so constructed that a single Yale key will operate all the locks on the car, and one turning of the key will so lock and disconnect the machinery that this feature furnishes almost absolute protection against theft. The lock switch, which is located on the dash, or cowl, can be set in any one of three positions. When set at the position designated as "night," the signal lights are turned on and locked and cannot be turned off from the main switch and the car cannot be started; when



With the New Electric Lock on This Car the Signal Lights, Starter, Magneto, and Horn can be Disconnected by One Turn of the Key. The Same Key is Used to Lock the Hood, the Tires, or Wheels at the Rear, and the Tool Compartments in the Dust Shield of the Running Board



These Automatic Gates are Designed to Guard Users of the Crossing against Switching Operations and against Approaching Trains or Trains Passing in Opposite Directions

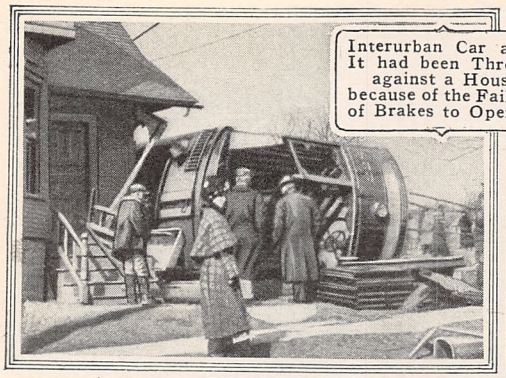
the key is turned to "day," the magneto is grounded, the lamps cannot be lighted, and the starter and horn will not work; when the key is turned to "on," everything is released for operation. The same Yale key opens the tool compartments, unlocks the bonnet, or hood, which is in two parts that can be removed separately, and operates the lock protecting the tires or wheels fastened at the rear.

DOUBLE AUTOMATIC GATES FOR RAIL CROSSINGS

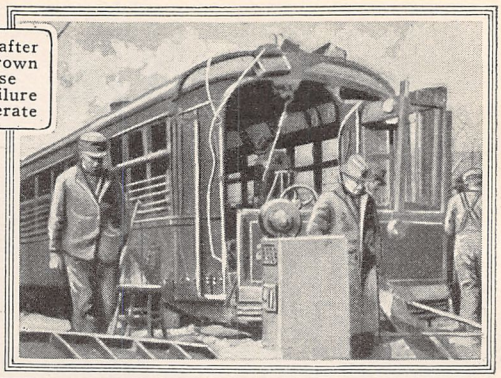
Double automatic railway-crossing gates which are electrically operated, and are intended to guard against every possible movement of trains, are being tested on a railway in Illinois. On each side of the tracks is placed a metal housing from which extend two arms that point upward when the tracks are free. As a train approaches within 2,000 ft. of the crossing a warning bell rings, a circuit having been closed; when the train is 1,500 ft. away, one arm descends either side of the track. At night a red light marks the position of the barrier. After the train has passed, another circuit is closed and the arms rise. The second pair of arms operates when a second or returning train or engine approaches the crossing just after the first pair has been freed. Thus a very common cause of crossing accidents is guarded against. A portion of a train can stand near a crossing indefinitely without keeping the gates down, but on the other hand they furnish full protection during switching operations regardless of the number of tracks. The gates are operated by storage batteries in combination with a ¼-hp. motor. Out of 6,000 operations the gates failed only four times; this was caused by faulty adjustment which was remedied during the early part of the test.

BINDER STRIPS USEFUL IN LETTER FILING

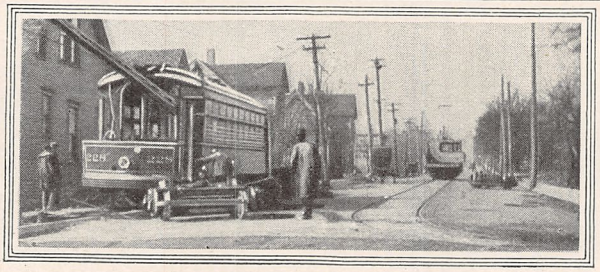
A type of letter file lately originated makes use of gummed tabs fastened to a long strip of cardboard, as the filing element. In use, letters are attached to the strip, at two different points by the tabs, it being possible to hold as many as two dozen sheets of



Interurban Car after It had been Thrown against a House because of the Failure of Brakes to Operate



The Car After It had been Righted, Showing a Telephone Pole That was Broken Off, the Shattered Vestibule, and Damaged Roof



Above: The Body of the Car Was of Steel and Resisted the Heavy Impact of the Crash. This Probably Saved the Lives of Many Passengers

paper to the same strip in this manner. In some cases a stiff Manila cover is provided to protect the sheets after filing. By the use of tabs the necessity for punching holes in the letters, as in some other files, is avoided. The gummed strips and tabs are made up in a variety of forms and lengths to suit the requirements of different office systems.

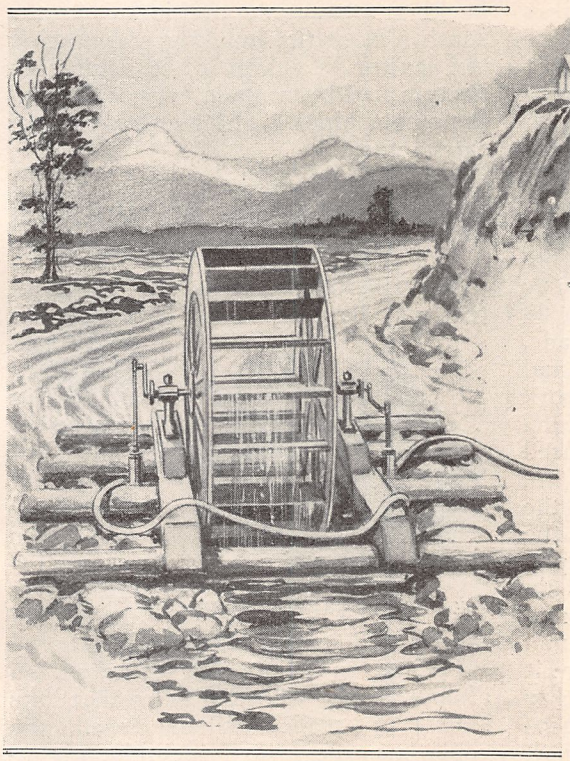
Strips of Gummed Tabs are Used to Hold Letters Together in New Filing System

INTERURBAN CAR THROWN AGAINST A HOUSE

The air brakes of a new, all-steel interurban car refused to work while rounding a sharp turn in Joliet, Ill., recently, with the result that the car left the track, struck the street curb sideways, and turned over on its side tight against the side of a frame house. The reason the broadside of the car struck the curb was that the front trucks held to the rails until the rear truck left them. There were 19 passengers, six of whom were injured rather seriously; none was killed. Had the conveyance been of wood the car would probably have crumpled and the accident would have been much more serious. The car broke off a telephone pole which crushed the vestibule and furnished a means of escape for the passengers. The overturned stove started a blaze which was soon extinguished. The porch of the house that was struck was partly demolished and the whole dwelling so shaken that a woman in an upper bedroom was showered with plaster and almost thrown from bed. The accident did not seriously interrupt traffic.

TEST SHOWS PERSISTENCE OF MUSK ODOR

Minute measurements of the decreasing weight of musk caused by its giving off odor, were completed recently in the laboratories of the University of Pennsylvania. After being dried in an oven at a temperature of 120° C. a lump of musk weighing 1.32245 milligrams was subjected to a steady current of dry air for a period of seven months. Scales of the greatest delicacy showed that the musk lost weight each day, beginning at .00318 milligram a day and diminishing to .00002 milligram a day. At the end of seven months the musk had lost all odor. This was not due to loss of moisture, for it remained odorless when freshly moistened. It would seem that all the volatile constituents of the musk were carried away by the current of air.



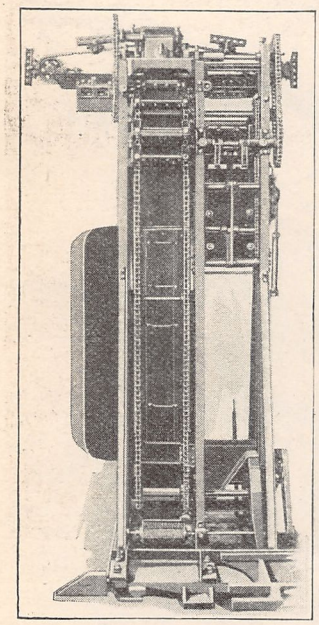
The Wheel Operates the Pumps and Raises the Water to a Height of About 50 Feet

WATER SUPPLIED TO CAMP BY INGENIOUS SYSTEM

While camping in the Sierras some time ago, members of a western outing club improvised a water system which worked effectively and proved to be a great convenience. A water wheel of medium size was placed in a swift mountain stream about 50 feet below the point where the tents were pitched. A small pump was set on either side and the piston of each connected with a crank extended from the axle. The water was forced to a canvas tank constructed on the slope above. From there it was conveyed to the camp through a rubber hose. A continuous flow of water was thus provided and much inconvenience averted by a small expenditure. With the proper materials at hand, an apparatus of this kind can easily be constructed in camp.

HEMP-FIBER MACHINE DOES WORK OF MANY NATIVES

A machine for stripping hemp fiber has been designed by an American mechanical engineer in the Philippine Islands, which, it is said, will produce 600 lb. of fiber per day. One man and an assistant are required to operate it. Approximately 15 pounds is the amount of fiber that four Philippine natives can produce with present crude methods, which often involve a waste of 60 per cent. The waste by the new process is estimated at 10 per cent, and it is the belief of the inventor that the uniformity of his product will make it worth 25 per cent more than the common grade.



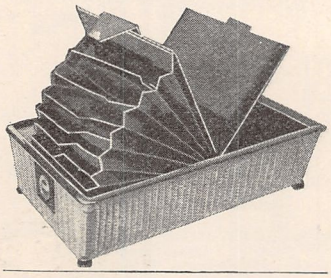
The machine is about 3 ft. wide and 10 ft. high, and the iron framework divides it into two slender parallel sections. The hemp is first prepared by reducing it to strips about 6 in. wide, ¼ in. thick, and as long as the plant. These strips are fed into the machine, one at a time, whereupon carriers, moving on an endless chain horizontally across the top of the machine, seize the upper end of a strip and carry it into the first section. Here it is held firmly in position by another clamp, while four sharp knives, moving vertically, pass over it lengthwise, shaving it and leaving nothing but the fine fiber. These knives are carried on endless chains which extend the length of the machine and travel at the rate of 20 revolutions per minute. After this process, the carrier again seizes the fibers and moves them into the second section of the machine, where they are pressed between four rubber rollers. The long, fine shreds are then taken out and dried and made ready for the market.

TRACTION ENGINE HEATS TEXAS HIGH SCHOOL

A traction engine was used to supply steam to the heating plant of the Sanger, Texas, high-school building following an accident to the regular heating system. In the midst of a severe cold spell during the past winter the boiler exploded and the school board was in a quandary as to how to heat the building, which was not constructed so that stoves could be installed. The problem was solved by backing a traction engine up to the south side of the building and placing the janitor in charge of it, after connection had been made between it and the steam pipes. The result was very satisfactory.

FILING BASKET OF WICKER FOR DESK PURPOSES

For the office man a filing basket that may be used on top of a desk is a neat accessory that is now being introduced. The body of this is substantially made of tan-colored wicker, and is 11 by 15½ in. in size. It contains an alphabetically indexed file that fits snugly in place. When closed, the cover may be locked securely, giving the device a sightly appearance. It may be used for filing current correspondence, orders, or reference sheets, and is especially serviceable when drawer space is none too adequate.



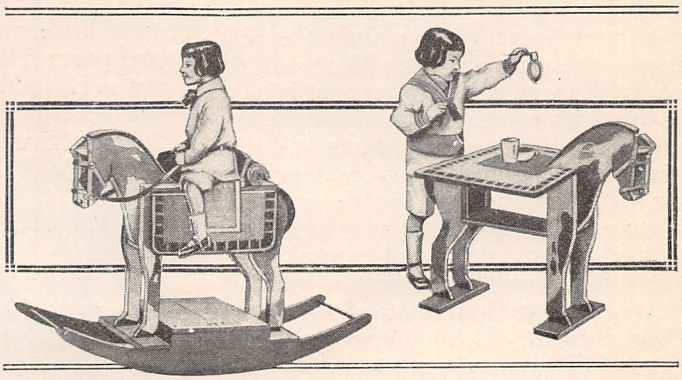
"STOP" SIGN REPLACES FLAG AS WARNING DEVICE

In its campaign to minimize grade-crossing accidents, the Chicago & North Western Railway has discarded the customary red flag as a warning sign for watchmen in suburban towns on the Milwaukee division and substituted a white-enameled disk bearing in large black letters the word "STOP." Upon the approach of a train this device is displayed by a guard so that it is clearly visible to pedestrians and vehicle drivers and leaves no doubt in their minds as to what is meant. A similar sign has been employed for some time by one of the eastern transportation companies, but in the West and most other parts of the country the idea is a new one. A further precautionary step has been taken by making crossing watchmen special policemen, uniformed and invested with the authority to make arrests when warnings are deliberately disregarded by careless pedestrians or motorists.

The "Stop" Sign Which is Used Instead of a Red Flag by Crossing Watchmen in Chicago Suburban Towns

ROCKING-HORSE AND PLAY TABLE COMBINED

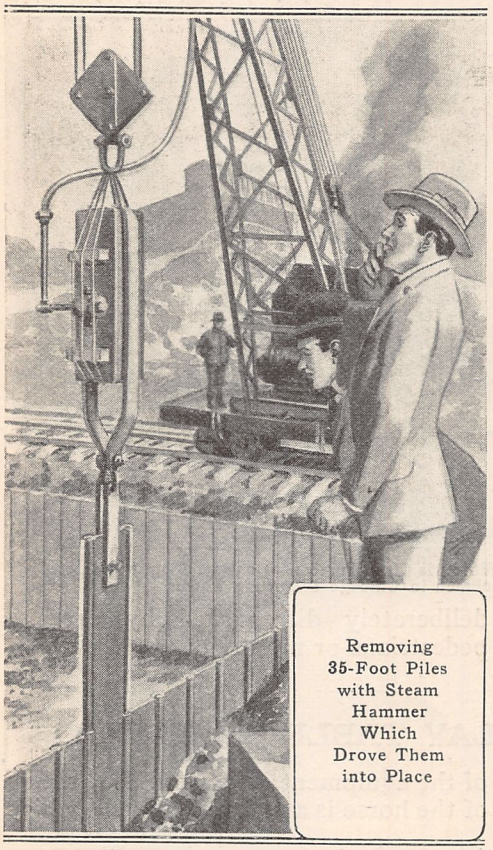
A brightly painted wooden rocking-horse that can be converted into a game table is a new toy for the play room. Both the saddle and the rockers can be removed. When the latter are detached the horse stands on four casters. The sides of the horse consist of flat boards hinged at the upper edge; by drawing these sides up like the leaves of a table a small table is formed. That part of the table top which is concealed when the saddle is in place has a checkerboard painted on it. A knapsack and a bridle are part of the equipment. Between the "sides" of the horse is a convenient shelf which is accessible when these sides are turned up.



A Substantial Rocking-Horse That can be Transformed Readily into a Play Table

PILES DRIVEN AND PULLED BY STEAM HAMMER

By a simple rearrangement of a steam hammer, such as is used in pounding piling into the ground, steel piles may be withdrawn almost as readily as they are driven. Work of this character was recently accomplished at Pittsburgh in connection with the construction of some cofferdams. A hammer was held in an inverted position by a crane and bolted to the piles one after another. In this way its 8¾-in. strokes were delivered upward and their force used to jerk the members out of the ground instead of driving them into it. The hammer, which delivers 275 blows a minute, was able to remove a 35-ft. pile in about an hour and a half. Concrete had been poured against the face of the sheeting and no effort made to prevent a bond. The cofferdams had also been back filled before the removal work was commenced. Several carloads of piles were pulled in this manner, and nearly every one of them was in good condition for immediate reuse after the operation.



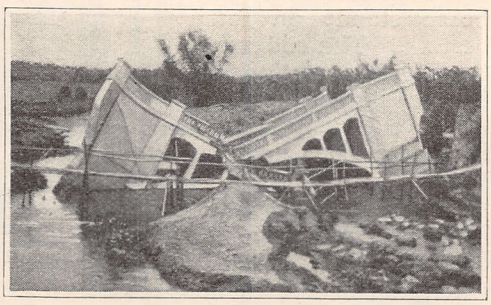
Removing 35-Foot Piles with Steam Hammer Which Drove Them into Place

TO MAKE PARTS OF SHIPS INTERCHANGEABLE

A New York shipbuilding company proposes to standardize the building of many of its ships, particularly freighters, so that corresponding parts of vessels in the same class will be interchangeable. This, it is claimed, will make possible a saving of 25 per cent in construction and will promote greater speed in building. All parts will be assembled before construction begins. It is estimated that by this method a 6,000-ton freighter can be thrown together in 30 days at the start; later the time may be reduced to 15 days.

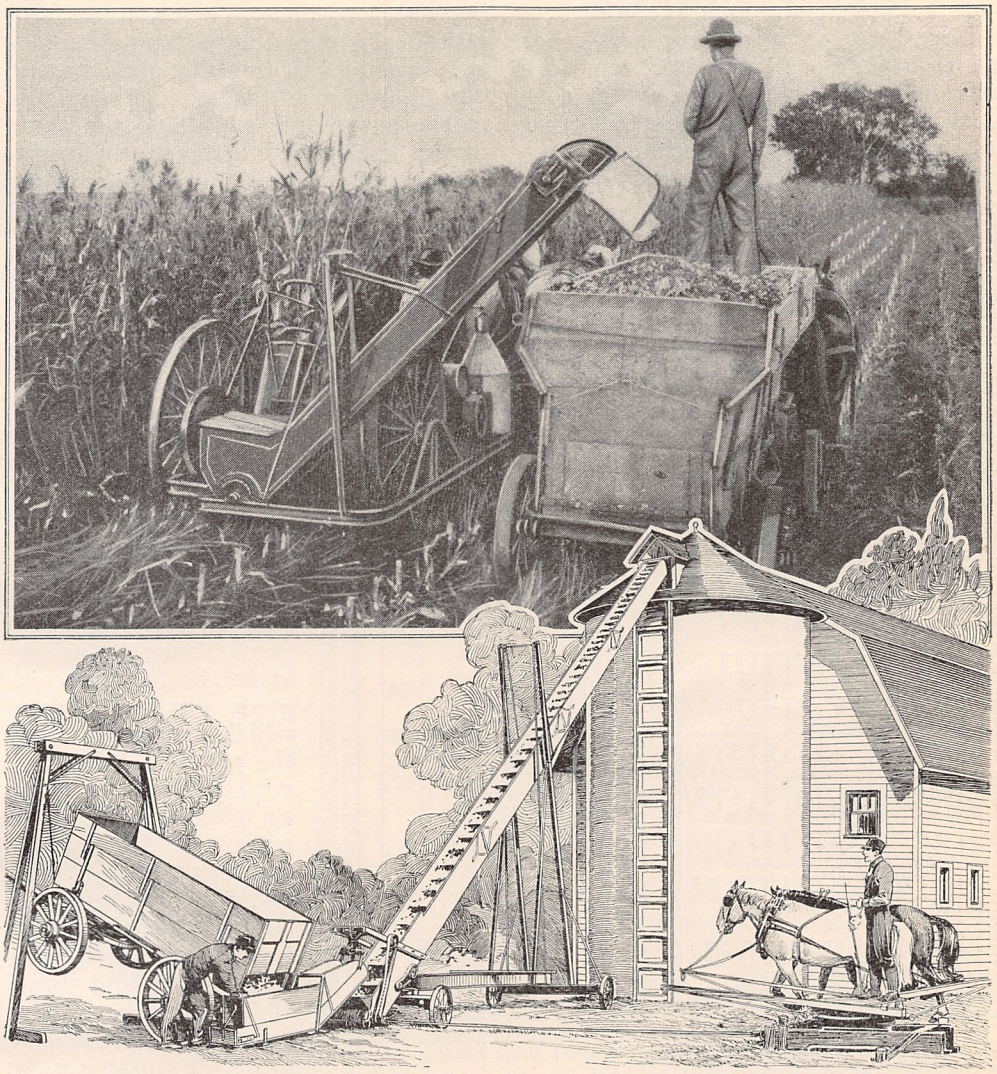
TYPHOON WRECKS CONCRETE BRIDGE IN PHILIPPINES

The havoc wrought by a typhoon which recently swept over a portion of the island of Luzon in the Philippines, is illustrated by the destruction of a heavy reinforced-concrete bridge which spanned a small stream near Los Banos. The foundations of the bridge were undermined, the approaches swept away, and the span itself broken in the middle so that the two parts fell forward into the middle of the stream, which for the time being had become a resistless torrent.



A Reinforced-Concrete Bridge in the Philippines as It Appeared after a Recent Typhoon

COST OF FILLING SILO CUT BY FODDER HARVESTER

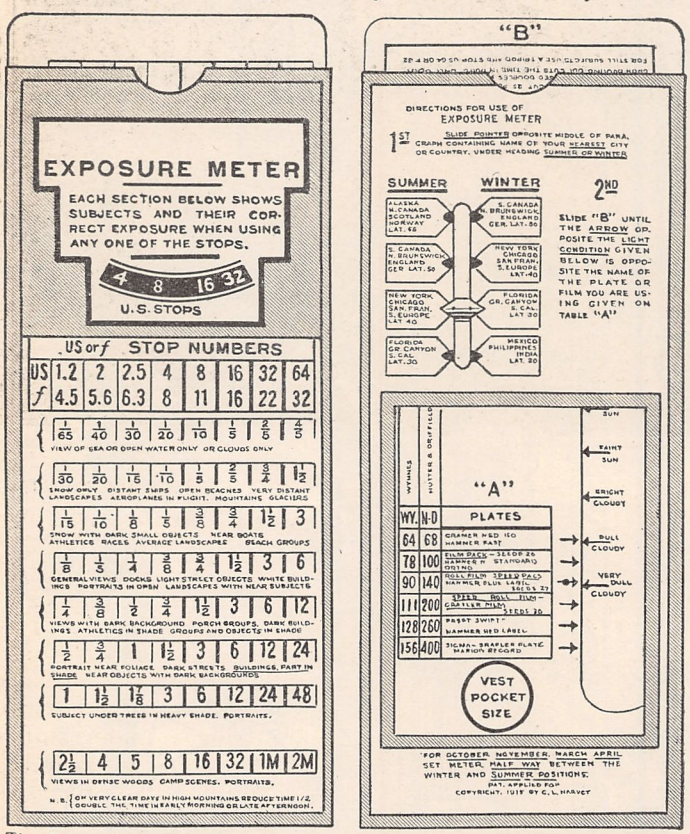


The Harvesting Machine Which Cuts the Fodder, Grinds It into Silage, and Delivers It into a Wagon, and the Conveying Apparatus Employed in Filling a Silo, are Shown in Operation

Both the time and labor usually consumed in cutting fodder, chopping it into silage, and storing it in a silo are materially lessened by a harvester lately developed by a Kansan. The machine cuts the fodder a few inches above the ground, throws it into a grinder operated by a small gasoline motor, and then discharges the fresh silage into a wagon driven alongside. At the silo the contents of the wagon are dumped into a bin which automatically feeds a conveyor. At no time during this process does the fodder or silage come in contact with the earth. The operation is completed quickly, and the product stored before there is any opportunity for it to dry. It is obvious that better than ordinary results are obtainable in this way. Four men and as many teams are able to harvest from eight to ten acres of fodder and store the resulting silage in a day's time with the outfit.

CAMERA-EXPOSURE SCALE FOR PHOTOGRAPHERS

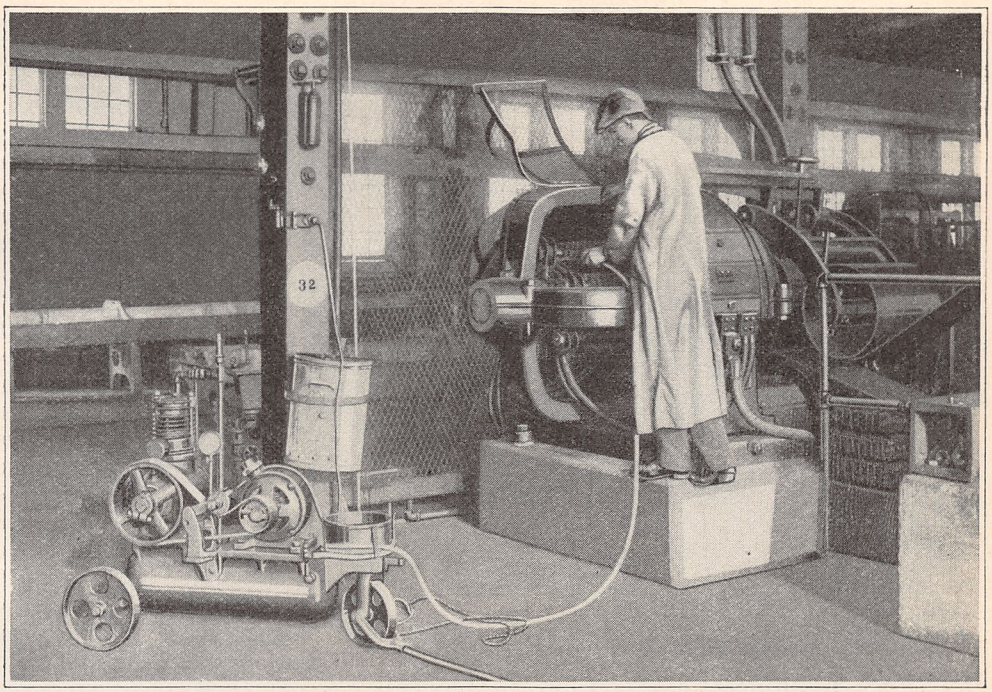
For the use of amateur and other photographers, a universal exposure table has been arranged in a very convenient form so that the proper timing under various light conditions for different classes of subjects may be determined quickly and accurately. It is made in vest-pocket size and consists of a sliding scale, fitted within a transparent celluloid case, which takes into consideration nearly all possible conditions of light, various latitudes, different plates, and films and stops. It obviates the necessity of making mathematical calculations, and if properly used, would undoubtedly eliminate a large percentage of the failures experienced by the beginner, while being of almost equal service to those who are prone to exercise care when making pictures. On one side of the device a small pointer slides in a slot between two lists of cities, states, and latitudes, grouped in paragraphs under the headings of summer and winter. The indicator is moved to the middle of the paragraph containing the name of the point nearest the user. Immediately below this table is another, which presents the names of various kinds of plates and films. To the right a slot makes visible a narrow margin on the reverse side of the exposure card upon which is listed the various light conditions. By sliding this one way or another until an arrow adjacent to "faint sun," for instance, points to "roll film," the device is adjusted. Then, by turning it over to its reverse side, a very complete chart is given which shows instantly the proper time to use with any stop and any subject. With the meter set for Alaska, summer, bright sun, and roll film, one may readily determine that to take a picture of a snow scene and use a 16 stop, a 1/10-second exposure should be made. By drawing the sliding chart out, tables covering night pictures of various kinds, shutter speed to stop motion, and daylight interiors, are given.



The Device Gives the Time Necessary for All Classes of Subjects with Any Stop Desired, Enabling a Beginner to Make Good Photographs

COMPRESSED AIR NOW USED TO CLEAN MACHINERY

The cleaning of electric motors, generators, and other machinery with compressed air has been found by many manufacturing concerns to be the most thorough and practical method of keeping such equipment in working



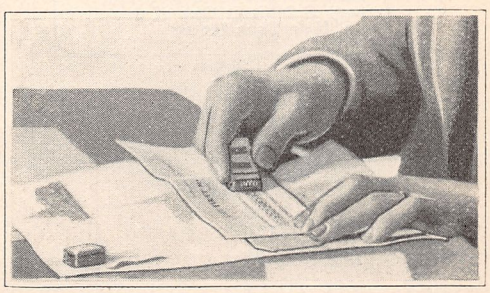
A Portable Electrically Driven Air Compressor being Employed to Clean Electrical Machinery

order. Despite all precautions, machinery or motors in sawmills, textile mills, flour mills, etc., will accumulate dust. This may settle on brushes and commutators, for example, in sufficient amount to cause serious trouble. Neither vacuum cleaners nor brushes are practical for cleaning the uneven and hidden surfaces. As a substitute for simple hand cleaning, compressed air is used. It may be supplied through pipes from a centrally located tank, or by a portable, electrically driven compressor which can be connected with any light socket. Such a machine is equipped with a long hose, at the end of which is a small nozzle having an opening of 1/16 to 1/8 of an inch in diameter. A pressure of from 10 to 60 pounds may be secured. A spring valve operated by the thumb keeps the air jet shut off except when needed. This machine is mounted on three small wheels and can be drawn about easily.

¶The Navy Department is listing all of its men who have a knowledge of some foreign language so that it can use them as interpreters, etc., if needed.

SIMPLE AND INEXPENSIVE CHECK PROTECTOR

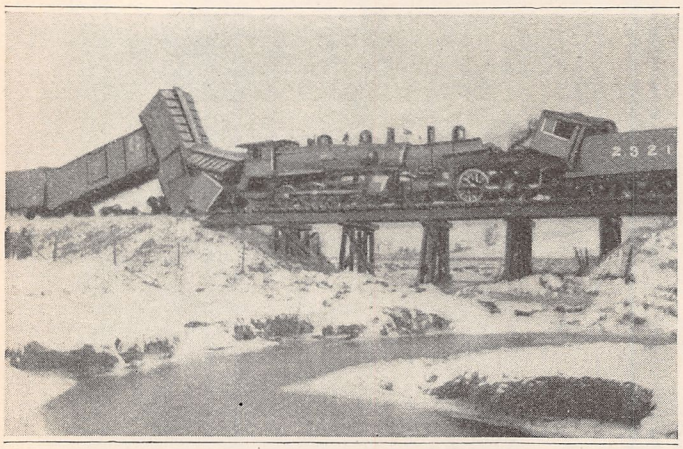
Compactness and simplicity are two of the outstanding features of a pocket-size check protector lately invented by a Californian. The device consists of a short holder which mounts a pair of rollers at one end. The largest of these is an embossing cylinder and is supplied with ink by a second member which is fitted above it. The paper is both pricked and inked as the roller is moved over it. This makes it impossible for a check to be raised without attracting immediate attention.



The Check Protector Is Small Enough to be Carried in One's Pocket Conveniently

TWO LOCOMOTIVES COLLIDE NEAR CENTER OF BRIDGE

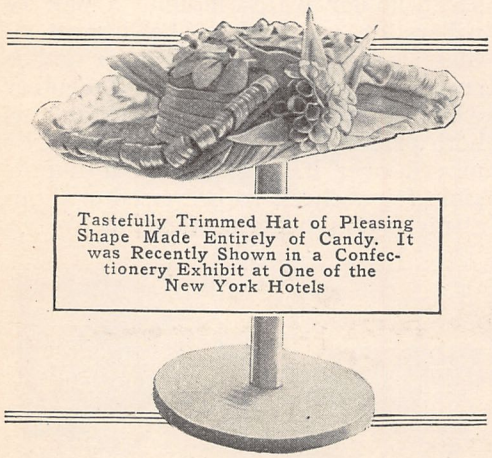
Though railway collisions are still rather common despite increased safety provisions, a head-on collision on a bridge is rare and spectacular. Such an accident occurred recently on a small bridge near Janesville, Wis. While a freight was slowly backing onto a siding to allow a fast milk train to pass, the latter came unexpectedly around a bend. The milk-train engine crashed into the freight engine near the center of the bridge at that point, but the impact did not hurl either from the track. The engine crews escaped by jumping from their cabs. The first freight car was shattered and forced up on end; the front end of the car behind it was propped up in the air about 10 feet. The cab of the milk-train engine was dislodged, and both tenders were damaged. The wreckage blocked the track for some time.



Two Engines as They Appeared Immediately After They had Collided near the Center of a Small Bridge: The Freight Train was Backing onto a Siding to Make Way for the Other, a Fast Milk Train

"PARIS HATS" FASHIONED ENTIRELY IN CANDY

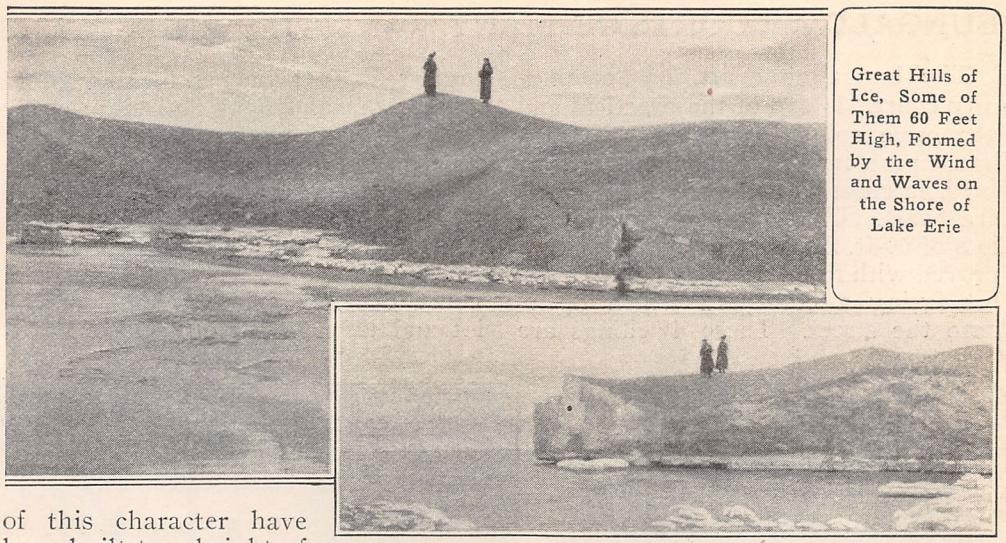
Dainty, stylish millinery creations which so far as attractiveness is concerned might have satisfied the demands of almost any modish feminine dresser, were recently displayed in a confectionery exhibit at one of the New York hostelries. In all, three hats were shown, each so artfully fashioned that it was hard to believe that it was composed principally of sugar. One of these was made of overlapping folds of glistening, strawlike ribbon. The brim turned up at the front and was trimmed with a candy dahlia, delicately colored and set off by green, velvety leaves. A broad band circled the flower-decked crown and ended in a bow at the back. Another hat was pale green in color and trimmed with pink-hued roses and soft, satiny ribbons. The third was rose-colored and adorned with foxgloves and lilies.



Tastefully Trimmed Hat of Pleasing Shape Made Entirely of Candy. It was Recently Shown in a Confectionery Exhibit at One of the New York Hotels

HILLS OF ICE FORMED ON SHORES OF LAKE ERIE

A phenomenon which often excites much interest in winter is the piling up of great ice hills along the shores of large bodies of water. These sometimes extend a considerable distance out from the land. On certain portions of Lake Erie's shore ice masses



Great Hills of Ice, Some of Them 60 Feet High, Formed by the Wind and Waves on the Shore of Lake Erie

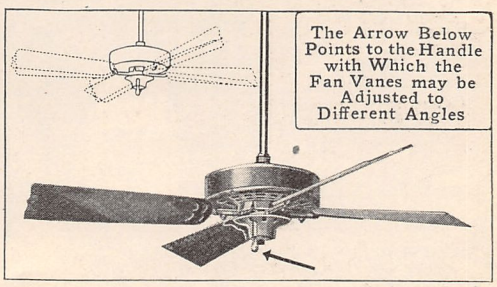
of this character have been built to a height of 60 ft. In some instances these hills have had their beginnings in large cakes of ice that have become anchored in shallow water, against and over which other blocks have been hurled. The mass slowly solidifies of its own weight. With the approach of spring portions of these hills break off and float away.

SUBMARINE PIPE LINES FOR LOADING TANK STEAMERS

A number of oil companies in Mexico, which ship much of their product by tank steamers, have overcome difficulties due to comparatively shallow water along the coast where the oil is stored by laying pipe lines on the bed of the ocean to such a distance from shore that tankers can anchor and, by using these pipes, load without difficulty. One of these lines, which is typical of the others, terminates in 43 ft. of water, which is below wave action. At the end of the pipe is attached 120 ft. of armored flexible hose, the free end of which is closed and lies on the sea bottom when not in use. Its position is marked by a buoy with which it is connected by a chain strong enough to raise it to the surface. In this depth the largest tank steamers can load at any time, and the dredging of deep channels to the shore is avoided.

ELECTRIC FAN CONSTRUCTED WITH ADJUSTABLE VANES

Adjustable blades, which permit the volume of the breeze given off by an electric fan to be regulated mechanically instead of by the means of rheostats, are a new feature of an apparatus of the ceiling type. A rod extending from the base of the fixture terminates in a pear-shaped handle with which the vanes may be turned to various angles so as to meet different demands. This presents a simple as well as adequate way of making such regulations. Heretofore the blades have been constructed without any convenient arrangement being given for changing their pitch. The new attachment does not make any noticeable difference in the appearance of the fixture. The adjusting rod locks the blades firmly and prevents them from working loose.

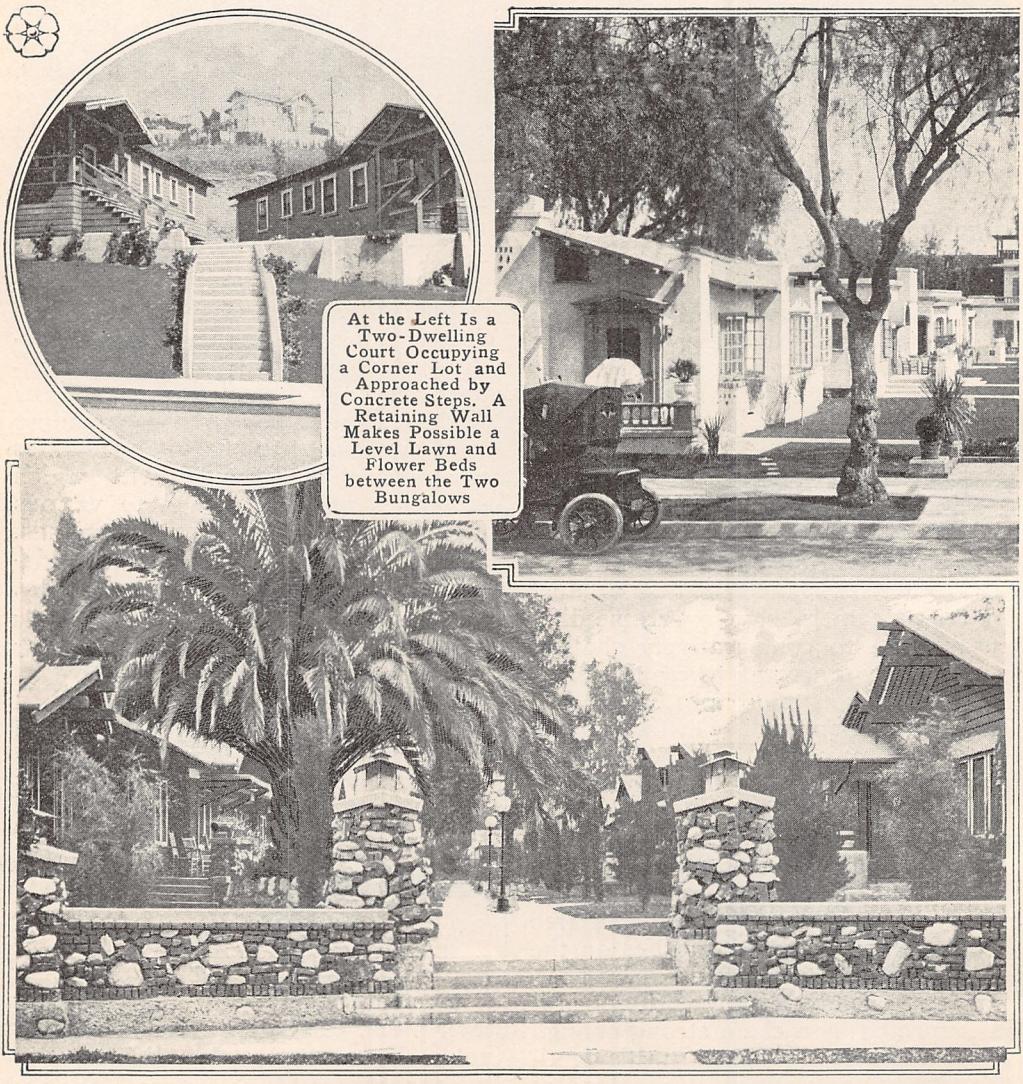


The Arrow Below Points to the Handle with Which the Fan Vanes may be Adjusted to Different Angles

BUNGALOW COURTS OF MANY VARIETIES AND STYLES

The bungalow court, or "community court," is one of the practical and attractive solutions of the dwelling-house problem which continues to gain favor in cities and suburbs of the western coast. Under this plan residence lots of 50-ft. frontage, or more, are improved with from two to 16 bungalows, set facing a courtyard which opens onto the street. These dwellings are preferred to apartments, for they afford more room and light and more easily take on the aspect of homes. They are generally rented furnished. Those of the better quality cost $2,500 to build, while others cost as little as $700, or even less.

The number of dwellings about a court depends on the depth of the lot and the amount of space devoted



At the Left Is a Two-Dwelling Court Occupying a Corner Lot and Approached by Concrete Steps. A Retaining Wall Makes Possible a Level Lawn and Flower Beds between the Two Bungalows

Above, Right: A View of a Court upon Which Face Bungalows Costing about $2,500 Each. These Dwellings Are of Solid-Wall Concrete and are Fitted with Every Modern Convenience. The Other Half of This Court is Shown on the Opposite Page. Below: A Court with 16 Bungalows, No Two of Which Are Alike. Along the Center of the Eight-Foot Cement Walk Are Flower Beds and a Series of Artistic Electroliers

to the central courtyard, which may or may not include a drive. Frequently this court is laid out with great skill and may contain a fountain and shade trees. Almost every known variety of building material is used in these structures, including concrete, cobblestones, stucco, brick, shingles, weatherboards, etc. The number of rooms varies from four to six or eight. Sometimes 12 or 16 bungalows are built about a court, no two of which are alike as to style or plan. One such court in Pasadena contains structures suggesting the architectures of Japan, India, Italy, Switzerland, the mission style, and other and more modern variations.

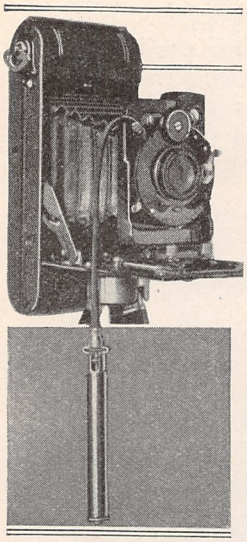
¶ Despite submarine perils, approximately 400,000 passengers crossed the Atlantic last year; of these, 250,000 traveled on vessels owned by belligerents.

Facing the Cement Walk, Which Extends the Length of This Narrow Court, Shown in the Oval at the Right, Are Frame Bungalows Costing About $700 Each

A Court Occupying a Lot 102 by 277 Feet: Here Are 11 Bungalows Designed in as Many Different Styles of Architecture, Including Japanese, Italian, Swiss, and Mission. These Dwellings, Furnished, Represent an Investment of $20,000, Exclusive of the Land. Common Courts Such as This One Afford an Opportunity for Pleasing Landscape Treatment. These Grounds Generally are Cared For by the Landlord

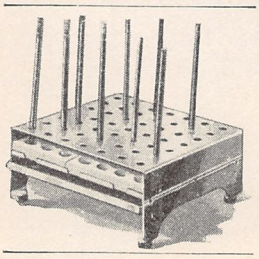
DEVICE OPERATES CAMERA AUTOMATICALLY

One of the simplest and most compact devices so far designed for automatically actuating the shutter of a camera and enabling an operator to include himself in a picture, is being introduced. Its size makes it especially attractive, for it is only 3½ in. long and no greater in diameter than a fountain pen. In principle it is somewhat similar to a pneumatic door closer. It is arranged at one end to be attached to a cable release, while a spring within it, the action of which is retarded by compressed air, operates a piston that strikes the plunger normally pressed with one's thumb. By adjusting a valve, provided at the lower end of the piston, the action of the instrument may be regulated to suit the user.



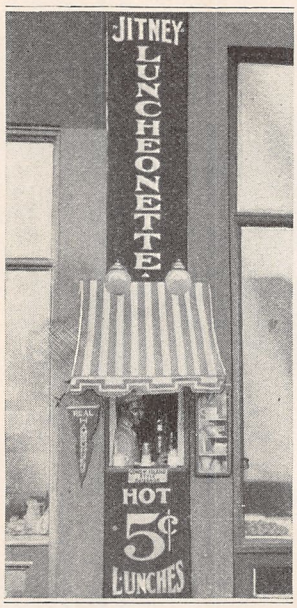
RACK DISINFECTS PENCILS FOR SCHOOL CHILDREN

Lead pencils are germ carriers which may transmit disease, especially to children, most of whom have the habit of putting pencils in their mouths. A New Jersey inventor has devised a disinfecting rack to guard against this danger. This rack consists of a square metal frame, or case, about three inches deep. In its top are small holes through which pencils may be inserted. Beneath the top is a tablet of clay composition in which are depressions corresponding to the holes above. Into these the pencil ends project, without touching the clay, and are disinfected by formalin gas exuding from the clay, which has been previously charged with that disinfectant. The pencil of each child may be assigned a certain place in the rack.



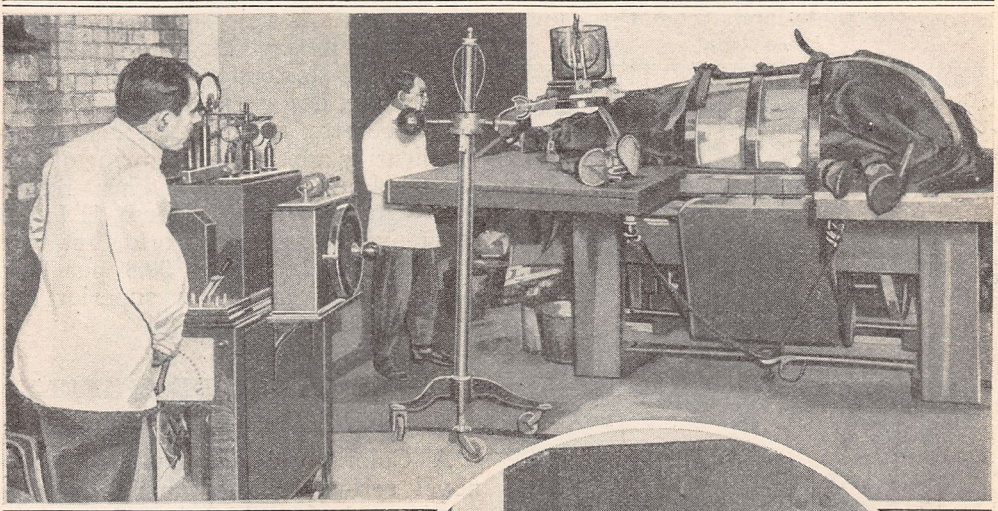
MINIATURE LUNCH COUNTER HAS TWO-FOOT FRONTAGE

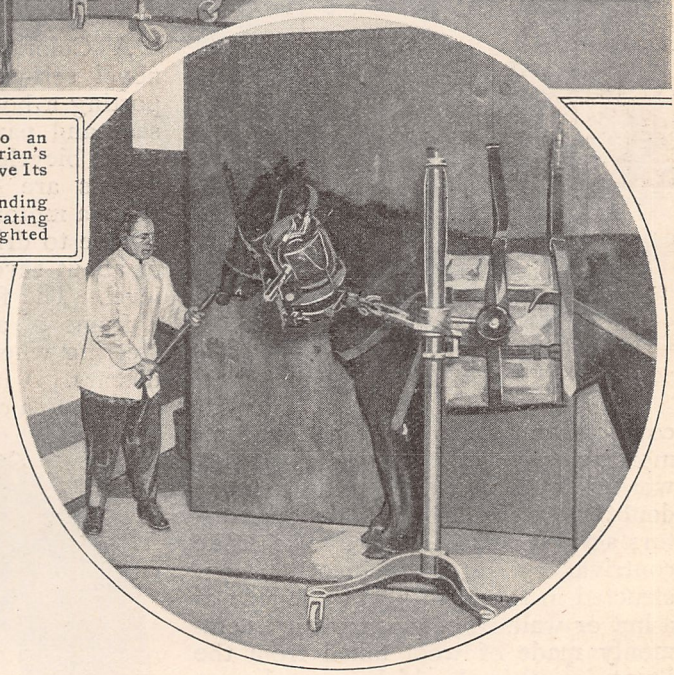
What is undoubtedly one of the narrowest business houses in the country is a lunch counter in Harrisburg, Ill., having a frontage of just 24 in. This miniature eating establishment is located between two ordinary-sized business blocks which for some reason were not set close together. The intervening space has been inclosed and equipped as a lunch counter. The narrow space is 54 ft. long. A neat awning and two large electric globes adorn the front. Beneath the awning is a counter at which one can purchase coffee, sandwiches, and other staple foods. Beside the counter a small show case displays appetizing dishes.



¶An artificial silk fiber, which it is claimed rivals real silk, is now made by use of chrysalis oil and mulberry cellulose dissolved in a proper solvent, which liquid is forced through minute holes.

X-RAY EQUIPMENT NOW USED IN VETERINARY HOSPITAL





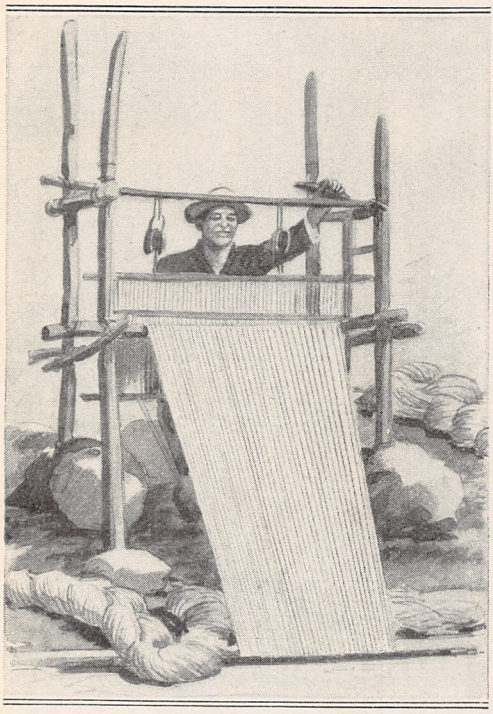
Above: A Horse Strapped to an Operating Table with a Veterinarian's X-Ray Apparatus Adjusted above Its Head
Right: The Horse in a Sling Standing beside the Tilted Top of the Operating Table, Which Is about to be Righted

What is believed to be one of the first instances in which X-ray equipment has been permanently installed for use in a veterinary hospital is that of an institution in New York City, the director of which, aided by electricians, has devised equipment and altered ordinary apparatus so as to make X-ray examinations of animals, large and small. Here dogs, cows, horses, cats, birds, and even monkeys have been brought during the past year. For horses and cows the veterinarian employs a large table with a tilting top operated by an electric motor. The animal to be examined is stood alongside the table, with the top tilted on edge, and is put in a sling and shackled. The top is then turned to a horizontal position, carrying the beast with it. By means of pulleys, wires, and an adjustable standard the X-ray tube can be easily swung to any desired point over the animal's body.

PRIMITIVE LOOMS ARE USED BY AYMARA INDIANS

Heavy woolen ponchos, or capes, are woven on the most primitive kind of looms by the Aymara Indians in the cold, barren puna region of the Bolivian Andes. These are usually made

in bright colors and are worn for protection against the cutting winds which sweep through the valleys and across the table-lands from the snow-



Typical Aymara Indian Weaving a Poncho on a Primitive Loom in Bolivia

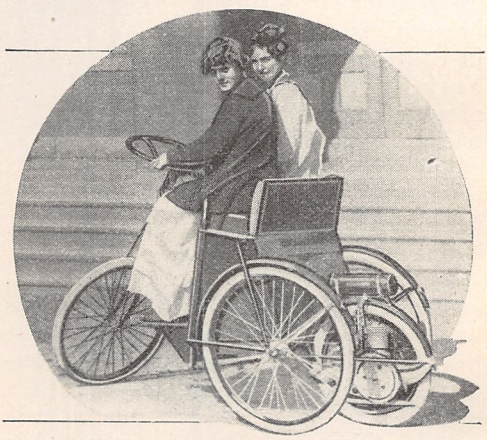
covered mountains. It is not uncommon to see both men and women working at looms, almost the same as doubtless were used by their ancestors several centuries ago. The crude contrivances are frequently constructed in the open air at one side of a hut or wall. The garments are commonly made of wool taken from the llama, an animal which is used as a beast of burden, or the alpaca.

NEBRASKA SAND NOW MADE INTO GLASS IN AMERICA

One result of the present war is that "quartz glass," largely used in laboratory equipment, which was formerly made chiefly in Germany, by processes controlled by the Germans, is now being manufactured in this country. What is pronounced by some to be the finest quartz sand, or silica sand, that is available for commercial use is found in Nebraska and, rather strangely, it is this sand which Germany used in large quantities and later exported to this country in the form of silica ware, despite a high duty. Test tubes, retorts, and many other pieces of scientific apparatus, are made of this sand and are acid-proof and heat-resisting. Quartz sand, of course, is found in many parts of the world, but that mined in Nebraska is 99.8 per cent silica, which makes it superior for manufacturing purposes.

NOVEL CAR MADE CHIEFLY FROM OLD BICYCLES

A Colorado dealer has devised a novel self-propelling vehicle by supporting a body, which includes a 3-ft. seat and parts of bicycle frames, on three bicycle wheels. The two rear wheels are 4 ft. apart and between these a motor wheel is attached, which is able to drive the vehicle at a speed of about seven miles per hour, on the level. The front wheel is fastened to a frame of a woman's bicycle, and a steering wheel is used instead of handlebars. A hand lever is connected by a chain to a coaster brake on one of the



This Vehicle is Constructed Chiefly from Parts of Old Bicycles and will Carry Two Passengers at the Rate of Seven Miles per Hour on Level Roads

rear wheels. The seat is furnished with cushions from a motorcycle. The cost of running this vehicle is small.

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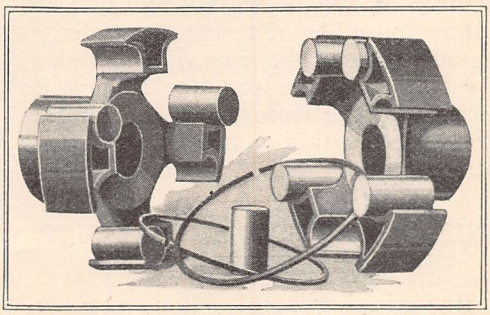
ROLLER USED IN FOREST INSTEAD OF SNOWPLOW

THE problem of breaking a roadway through the snow-carpeted forests to or from lumbering camps has been solved by a western lumber company by the use of a giant snow roller. It has been found that it is preferable to snow shovels or snowplows. The twin cylinders used are so heavy and of such large diameter that they are able to break through almost any snowdrift. A team of 16 horses is required to haul this roller. After it has passed over a road the snow is packed so hard and smooth that sled runners can quickly make the icy tracks which are so desirable for hauling heavy loads of logs.

FLEXIBLE COUPLINGS STOP STRAIN ON POWER SHAFTS

Shafting on which pulleys and similar apparatus are mounted in factories comes in comparatively short lengths and is often more or less crooked due to inevitable mishaps in handling. Even though the bends may be so small as to be invisible to the unaided eye, they interfere seriously with the smooth running of the shafts when in use. To obviate this difficulty a new form of flexible coupling has recently been devised. It consists of two cast-iron spiders mounted on the abutting ends of two shafts. Between the interlocking arms of the spiders rubber cylinders are placed, these taking up any unevenness in the long rods as they revolve. Thus the heating up of bearings and general vibration is eliminated. The coupling

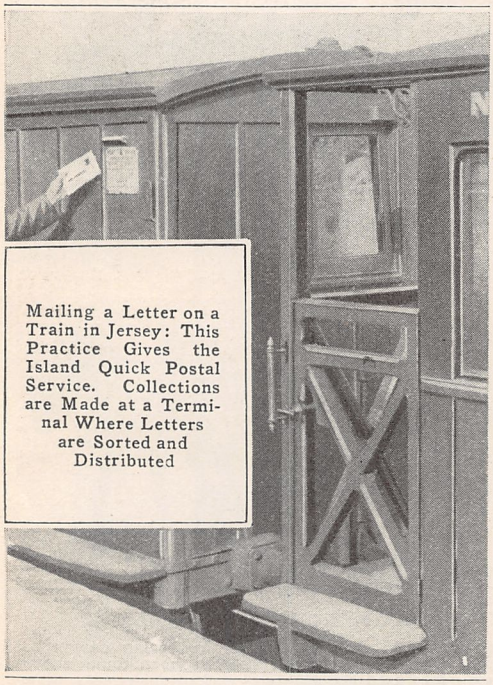


A Flexible Coupling Which Relieves Strain on Shafting: The Rubber Cylinders are Inserted between the Members to Lessen the Play and Vibration

finds particular application in the joining of armature shafts of electric generators with those of the driving engines.

POST LETTERS ON TRAINS OPERATING IN JERSEY

In order to facilitate the handling of the mails in Jersey, the largest of the Channel Islands, mail drops are provided in certain of the cars on every train running over the insular railway systems. Collections are made from these boxes at a terminal station, and the mail is subsequently sorted and distributed. Although the island has an area of only 45 square miles, it has a large number of towns and villages in addition to the city of St. Helier. By following the practice of posting letters on the trains, people living in the various parishes are afforded good service.



Mailing a Letter on a Train in Jersey: This Practice Gives the Island Quick Postal Service. Collections are Made at a Terminal Where Letters are Sorted and Distributed

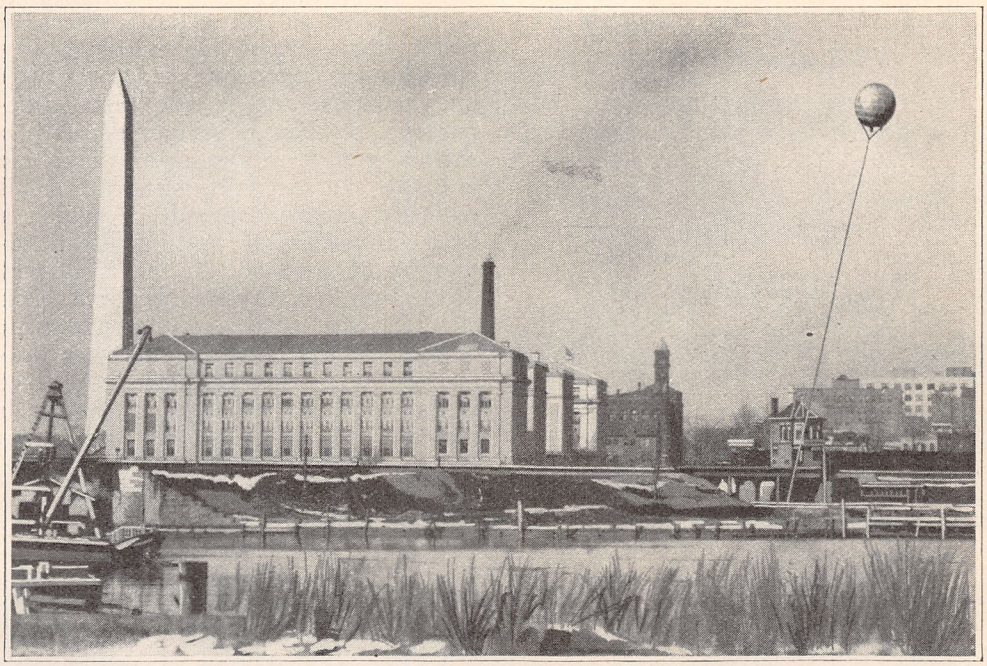
NITER CAKE IS SUBSTITUTE FOR SULPHURIC ACID

Encouraging results have attended the experiments made of late in England with niter cake as a substitute for sulphuric acid. It has been used on a broad scale in a number of Yorkshire mills in different ways, such as for the extraction of grease from wool suds and for rag stripping. The attention of American interests has been called to this by the government on account of the great quantity of the material produced here during the last year in connection with the manufacture of nitric acid. About 30 per cent of the weight of the cake is sulphuric acid. Apparently the best method of using it consists in dissolving it with the aid of steam and employing it in solution while hot.

CONVENIENT INDEX SYSTEM FOR TELEPHONE BOOK

Patent rights have been granted to a California inventor who has devised an index system for bulky telephone directories. The index is so made that it may be removed quickly from an old book and inserted without difficulty in a new issue by the user. It consists of 26 sheets of heavy paper, to each of which is attached in the proper position a lettered thumb tab. A special binding for the volume carries rings at the top and bottom which hold the index sheets the same as does a loose-leaf book. While it is of obvious convenience for the telephone subscriber, it also offers space for 52 pages of advertising matter.

Convenient Index System for Telephone Directories, Arranged so That It may be Transferred to New Volumes as They are Issued



The Question of How Much the Landscape would be Marred by Four Proposed Smokestacks in Washington, D. C., was Studied Recently by Allowing This Captive Balloon to Ascend over the Site to the Height of the Proposed Stacks

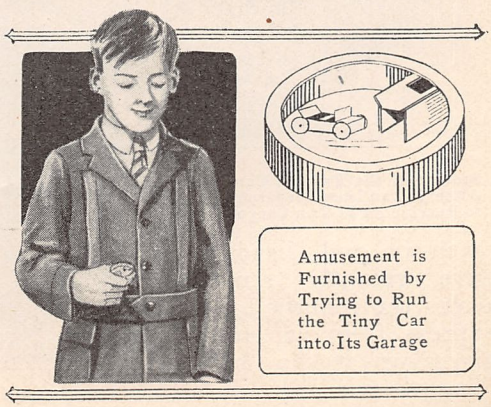
BALLOON USED TO SELECT SITE FOR CHIMNEYS

A captive balloon was recently sent up in the city of Washington to a height of 170 ft. for the purpose of ascertaining whether or not four proposed smokestacks of that height would mar the view of the landscape from the White House, the Capitol, the Lincoln Memorial, and other public buildings. The stacks were to be a part of a central heating plant designed to serve several public edifices. The National Fine Arts Commission, and other bodies, opposed the location of the plant on the ground that the stacks, particularly, would be offensive to the eye. By placing the balloon over the site at the height of the proposed chimneys it was possible to ascertain to just what extent they would appear in various vistas.

¶The printing of Japanese schoolbooks in Roman letters has begun in Honolulu. Japanese there predict that in 50 years Japan herself will be using the Roman characters exclusively.

TINY GARAGE AND CAR ARE FEATURES OF NOVEL TOY

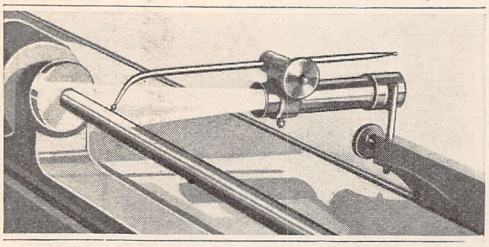
A novelty, which is proving popular because it requires skill and patience to operate, consists of a circular metal box, 2 in. in diameter and ½ in. high, covered with a glass top. In the box is a miniature automobile which moves about with the slightest tilting of the toy. At one side of the circular inclosure is a miniature garage. Amusement is furnished by attempting to get the automobile into the garage.



Amusement is Furnished by Trying to Run the Tiny Car into Its Garage

TEST INDICATOR DESIGNED FOR MACHINISTS

For the use of machinists an indicating device has been invented which



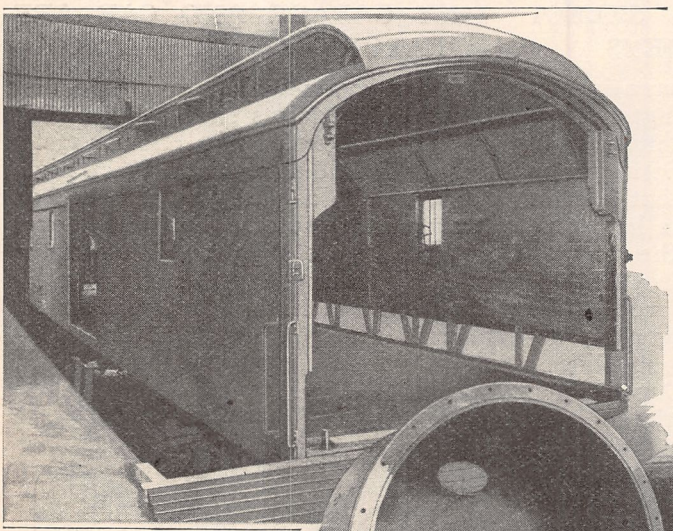
When the Point of the Needle Comes in Contact with a Raised or Irregular Place on a Piece of Work a Connection is Made and the Tiny Lamp Ignited

relieves all strain on the eyes when one is truing up work. It permits an operator to proceed considerably faster than when he is depending chiefly upon his vision to detect slight irregularities, and it also insures accuracy. It may be employed with a surface gauge on almost any machine or lathe. In part it consists of a small cylinder on the top side of which a long, curved needle is held in an adjustable mounting. In the front end of the tube is a tiny electric lamp, back of which is a battery. When the point of the needle in moving above a surface touches a raised place a contact is made and the bulb lighted. The flash indicates the position of the irregularity so that the work can be shifted accordingly and the defect corrected immediately.

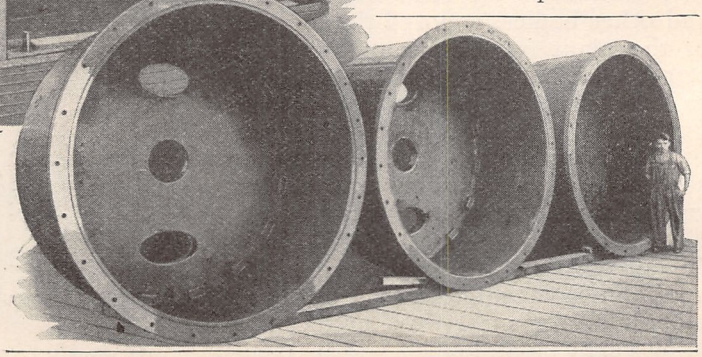
HEAVY MILL HEADS SHIPPED BY FAST EXPRESS

In order to prevent a partial tie-up of an Arizona copper plant, three seven-ton mill heads were recently sent across the country by express from an engineering works in Pennsylvania. Ore is crushed in a mill, similar to a tumbler, made up of a pair of these heads bolted together and supported at either end on trunnions.

When it came time to load the heavy castings for shipment it was found that they were too large to pass through the doors of an express car. It was finally necessary to cut out one end of a car, remove the sheathing to a height of about 18 in. on both sides, chisel away ½ in. of the uprights, and take out the lighting and heating fixtures before the castings could be set in place. Even



Section of the Express Car After It had been Prepared to Receive Its 21-Ton Cargo



The Three Mill Heads Ready for Shipment to Arizona

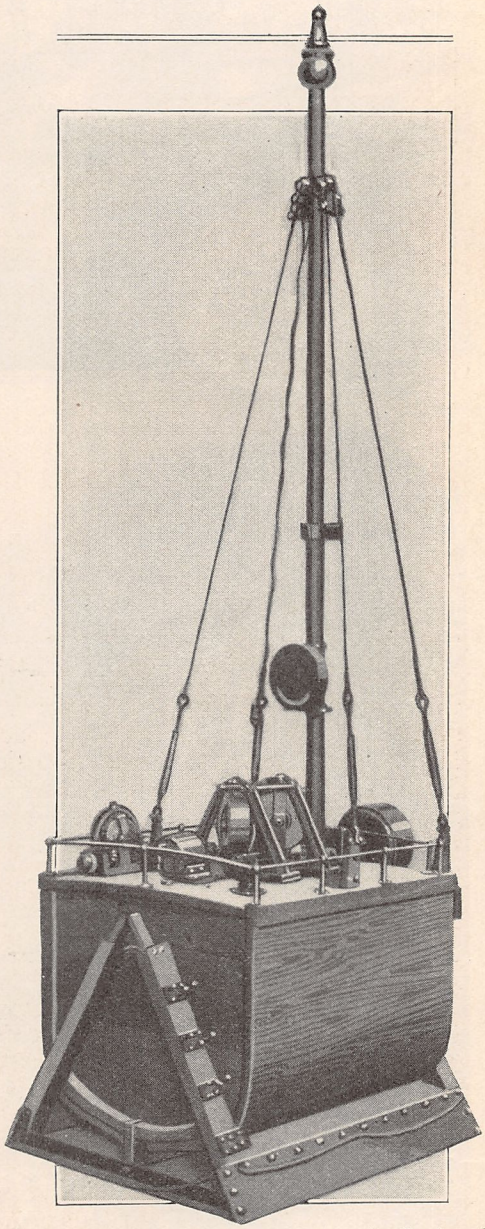
then it was a close fit, for the mill heads were wider at the base than the car floor. The loading was done with the assistance of cranes, and the castings were moved on rollers to their respective places, where they were securely bolted to the floor to prevent them from breaking loose during the journey.

MERCURY PURIFIED BY SIMPLE PROCESS

A European chemist has perfected an old process for the purpose of purifying mercury. It promises to be preferable to the methods more commonly employed. Mercury used in laboratories gradually becomes contaminated with dirt, zinc, copper, lead, etc. It can be purified by a series of distillations or by treatment with nitric acid, both of which processes require much time. The newly perfected process consists in passing through heated mercury a current of air which oxidizes the metals held in solution. For this purpose an iron tube, about 5 ft. long and 1 in. in diameter, is placed on two supports in a slightly inclined position. At the two extremities of the tube two tubular necks are attached, one serving to admit air and the other mercury. A Bunsen burner provides heat from 150° to 160° C. With this apparatus about 22 lb. of mercury can be purified in 24 hours.

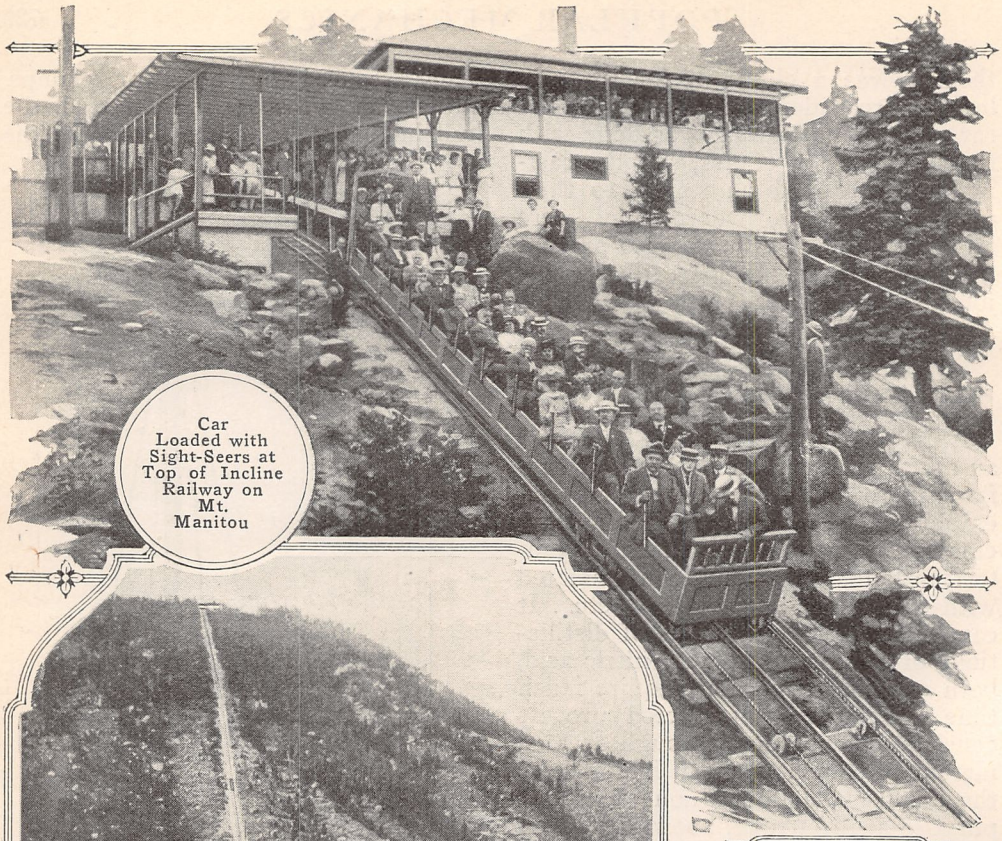
SHIP STABILIZER'S ACTION DEMONSTRATED CLEARLY

One of the interesting exhibits at a recent motorboat show in the East was that of a well-known gyroscopic ship stabilizer. The apparatus itself has been described previously in this magazine and is being employed on naval and other vessels to enable them to ride smoothly at all times. To display the instrument to advantage, a wooden device resembling a section of a cruiser's hull was mounted in a frame so that it could be rocked from one side to the other by a motor. The stabilizer was set on the deck without being secured by bolts or clamps. When the gyroscope was started, the hull immediately stopped rocking, the

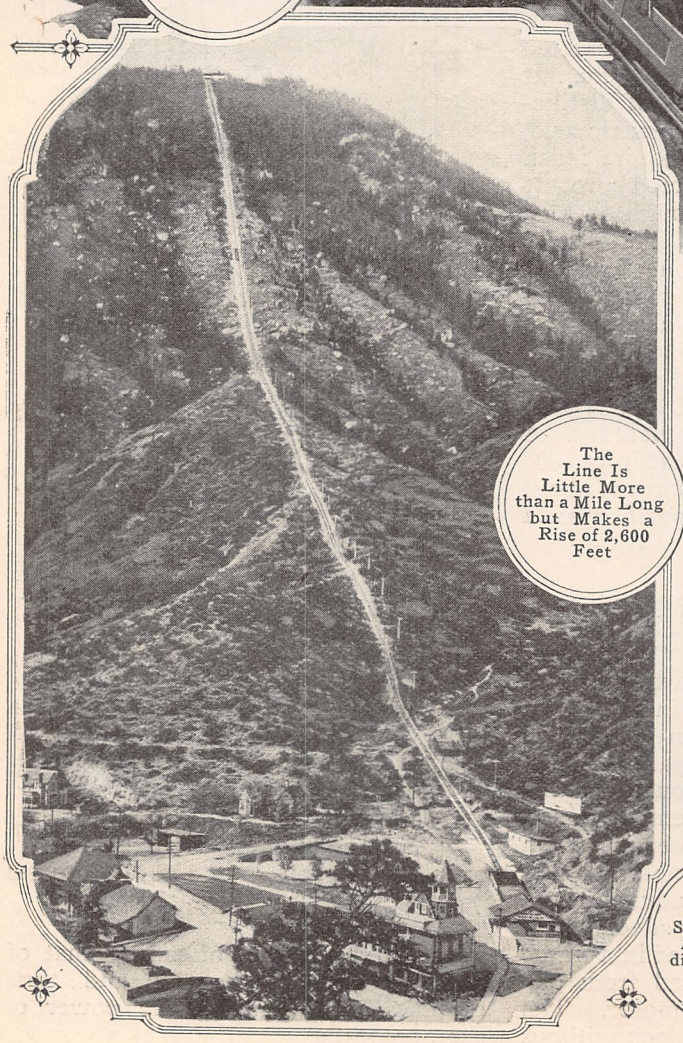


The Gyroscopic Stabilizer was Set on the Deck and When Brought into Use Stopped the Rocking Movement Given the Hull by a Motor

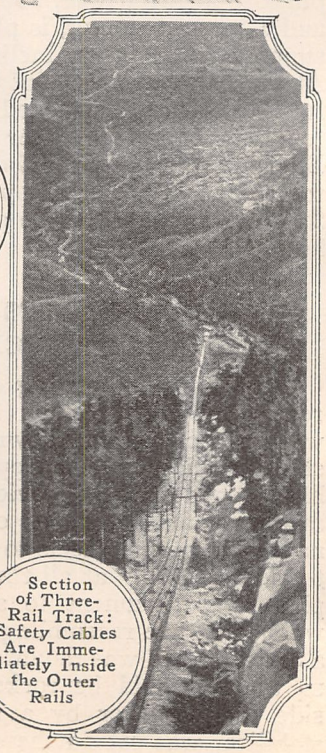
effect of the former offsetting that of the opposing mechanism and thus graphically illustrating the power of the apparatus.



Car Loaded with Sight-Seers at Top of Incline Railway on Mt. Manitou



The Line Is Little More than a Mile Long but Makes a Rise of 2,600 Feet



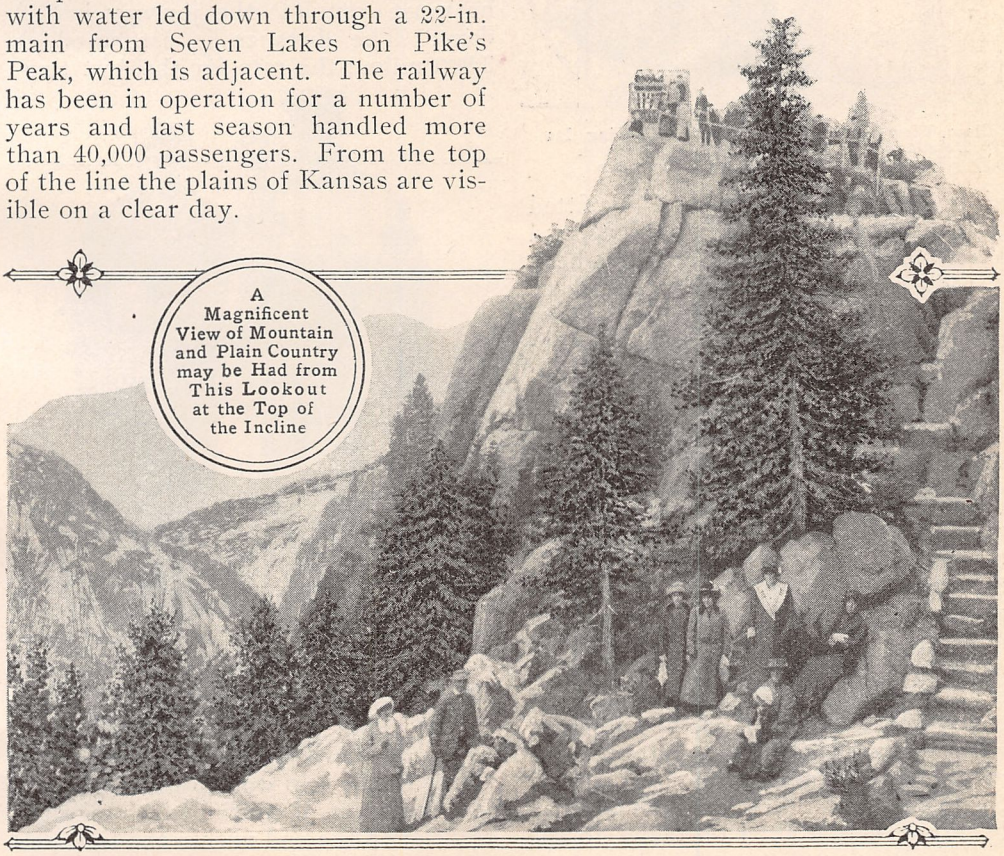
Section of Three-Rail Track: Safety Cables Are Immediately Inside the Outer Rails

STEEP COLORADO MOUNTAIN HAS INCLINE RAILWAY

An incline railway which scales Mt. Manitou in Colorado has a maximum grade of 68 per cent, and makes a rise of 2,600 ft. in a distance of 1¼ miles. It operates two cars, one at either end of a heavy steel cable which is wound about two 7-ft. sheaves at the upper terminal. As one of the cars, each of which has a capacity of 33 passengers, descends, the other ascends. A three-rail track extends up the mountain and merges into a four-rail double track at a halfway point where the two cars pass each other. In most technical respects the system is the same as others of its general type. Auxiliary cables pass through safety clutches beneath the cars to insure against accidents. Hydroelectric power is used in driving the machinery, and is developed at the foot of the mountain with water led down through a 22-in. main from Seven Lakes on Pike's Peak, which is adjacent. The railway has been in operation for a number of years and last season handled more than 40,000 passengers. From the top of the line the plains of Kansas are visible on a clear day.

MANY INVENTIONS SENT TO NAVAL BOARD

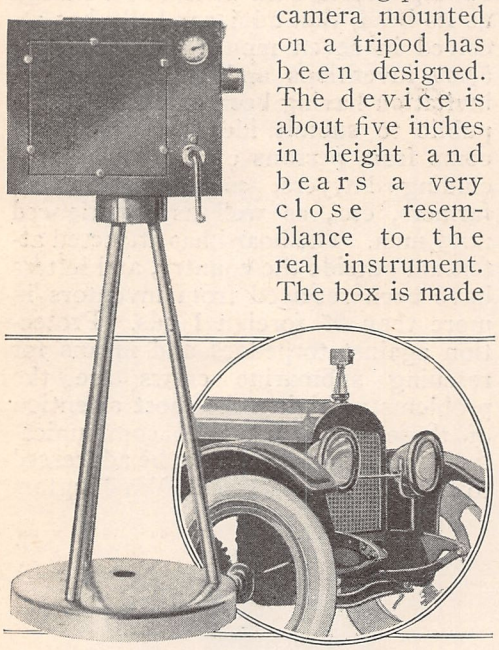
Since the creation of the Naval Consulting Board, with Thomas A. Edison as its head, that advisory body has received in seven months no less than 5,000 inventions and suggestions, an invitation having been extended to the public to submit ideas. These have come from persons of every class, including lawyers, ministers, miners, farmers, etc., as well as experienced navy men. The board has attracted attention outside the country, and letters have been received from inventors in more than 25 foreign lands. Protection against torpedoes and means for rescuing submarine crews are the problems receiving the most attention of these inventors. All communications for this board should be addressed to the Navy Department, Washington.



A Magnificent View of Mountain and Plain Country may be Had from This Lookout at the Top of the Incline

TINY MOVIE CAMERA USED AS RADIATOR ORNAMENT

As an ornament for the radiator of a motor car, a miniature moving-picture camera mounted on a tripod has been designed. The device is about five inches in height and bears a very close resemblance to the real instrument. The box is made



Close View of Miniature Camera, Showing Its Details, and a Glimpse of the Ornament in Place on a Radiator, are Given Above

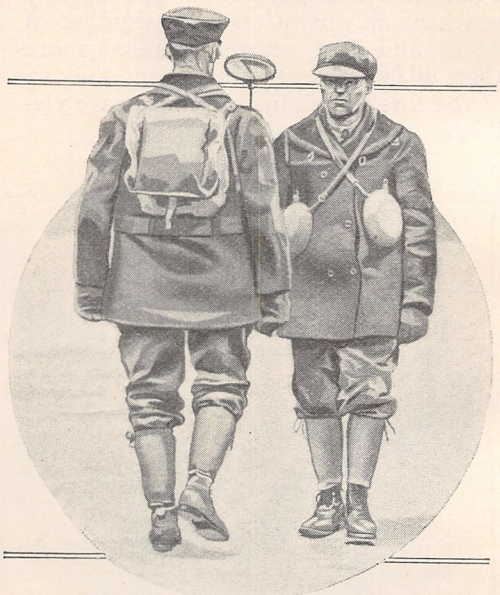
of polished mahogany and is fitted with a tiny crank, film meter, lens, and other characteristic parts. It has been introduced on the Pacific coast, where it is becoming quite commonly used by those who are connected with the photoplay industry.

PORTO RICANS AS AGENTS IN SOUTH AMERICA

The free-employment bureau maintained by the Porto Rican insular government is offering to this country's exporters to South America, and to prospective exporters, the services of a number of young Porto Ricans who have been educated in the American-conducted high schools and schools of commerce in the island, are familiar with business courtesy and business methods, and speak both English and Spanish. Ignorance of Spanish has been one of the chief obstacles to the United States' trade expansion in South America. The bureau believes that these young men can perform just the service which has been largely lacking heretofore in efforts to secure Latin America's trade, because of their familiarity with its customs and life.

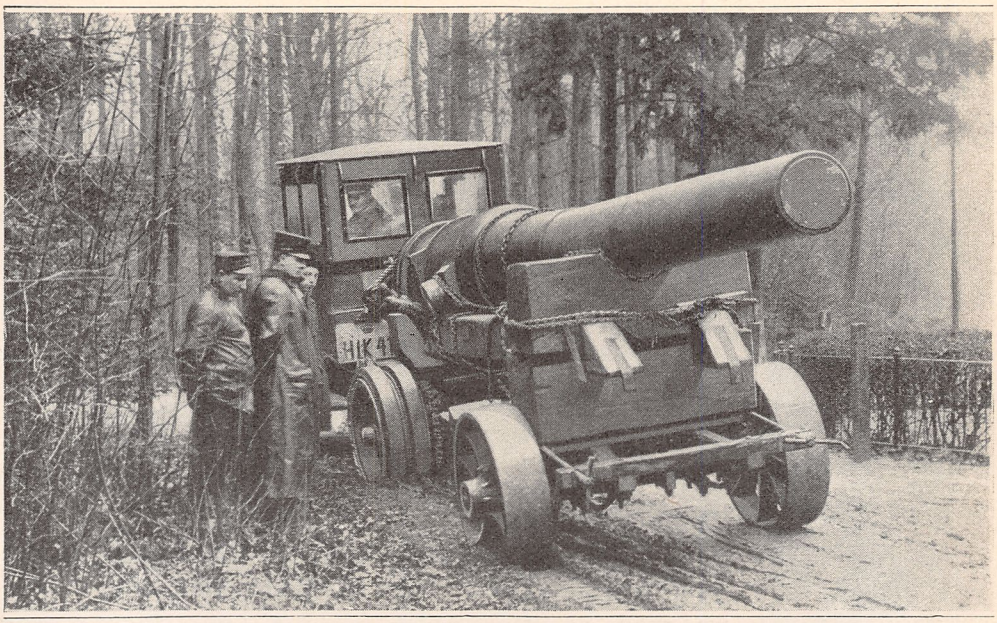
WALKING BACKWARD FROM COAST TO COAST

For the sake of earning a wager of $20,000 a man 50 years old is walking backward from San Francisco to New York. The performer of this out-of-the-ordinary feat left the west coast Aug. 5, 1915, and passed through Chicago February 8 of this year. He is equipped with a mirror so supported by a standard and straps that it affords him a view of the path along which he is moving backward. The remainder of his simple equipment is carried in a pack on his back. To win the wager he must complete the journey in 260 days. The distance is estimated at 3,900 miles; the rate for the first two-



The Man with the Mirror above His Shoulder is Walking Backward from San Francisco to New York. If He Accomplishes the Feat in 260 Days He Wins a $20,000 Wager. The Other Man Is a Traveling Companion

thirds of the trip was 15 miles a day—just sufficient, if continued, to take the traveler to the end within the time set.

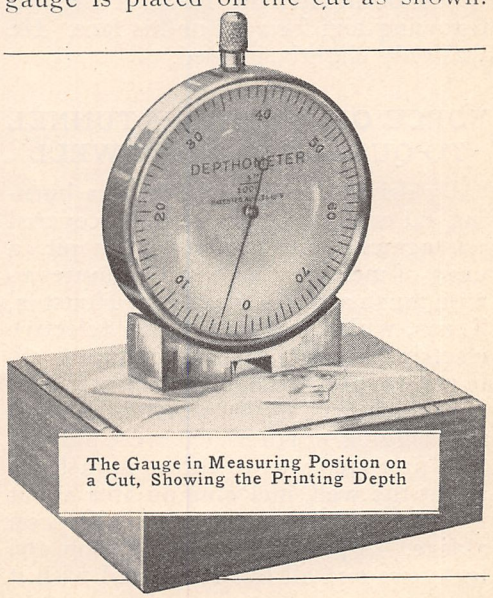


TRUCK HAULS TWENTY-TON GUN OVER BAD ROADS

AMERICA'S commercial invasion of Europe is well illustrated by this powerful American-made motor truck which is shown hauling a 20-ton gun over a European road. The gun is 26 ft. long. Its great weight caused the broad wheels of the trailer to sink into the earth at times, but the motor was strong enough to continue with its load and complete the journey of 11 miles in an hour and a half. Formerly it took a day and a half to haul similar guns this distance.

PRINTING DEPTHS OF CUTS SHOWN BY GAUGE

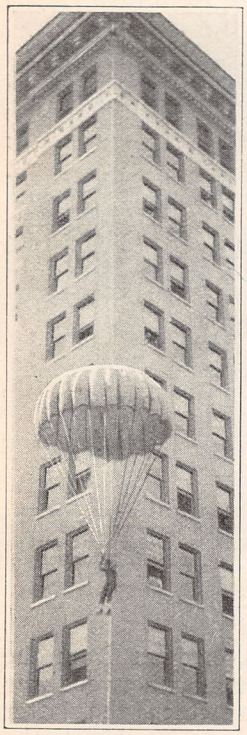
To displace guesswork with accuracy, a delicate gauge which measures the printing depths of half-tones, electrotypes, and stereotypes, and thus indicates at a glance whether or not they are properly made, is being brought into use. With this device, poor printing due to imperfect plates is forestalled, while the time-worn practice of pressmen charging their mistakes against the engraver or electrotyper, and vice versa, is eliminated. The instrument is made in different styles, one of which measures to $^{80}/_{1000}$ of an inch. A "shallow cut" is instantly discernible. On the other hand if the gauge shows a half-tone to be of standard depth, and the printing comes out poorly, no room is left for arguments in fixing the blame. The device is less than 3 in. in height and has a 2-in. dial with large spacings which are easily read. The measuring is done by a needle which projects from the bottom of the instrument between two level standards on which the latter rests. To make a measurement, the gauge is placed on the cut as shown.



The Gauge in Measuring Position on a Cut, Showing the Printing Depth

ACROBAT WITH PARACHUTE LEAPS FROM SKYSCRAPER

For the benefit of a motion-picture concern an acrobat, clinging to a parachute, recently jumped from the top of a skyscraper in Jacksonville, Fla., and landed on the ground without serious mishap. The parachute did not open until the man had fallen about halfway; thereafter the descent was much less rapid, and a landing was made about 20 ft. from the point immediately below the starting point. The acrobat missed the trolley wires of the adjacent street by a short distance and alighted on both feet, the force of the fall throwing him forward on his face. He was only slightly injured.

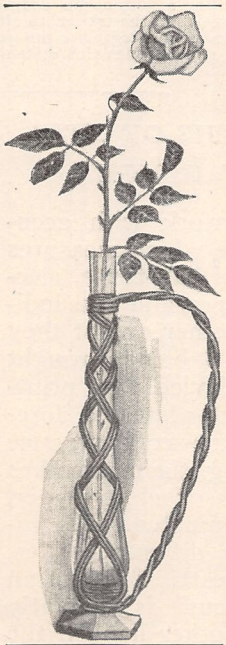


FORCE OIL THROUGH TUNNEL TO QUENCH BURNING WELL

By driving burning oil from a burning oil well through a small covered passageway into a temporary pit, a gang of men were able in 15 minutes to extinguish a costly blaze near Houston, Texas, which was caused by defective electric wiring. But it required 16 hours to prepare for this effort, during which time $6,000 worth of oil, and well rigging worth $5,000, were burned. The first step was to throw up a levee about the well, inclosing an area about 100 feet across, which area was soon ablaze. A pit was dug 100 ft. from the inclosure and all but connected with it by a trench in which was laid an old smokestack that was covered with earth. Near by steam boilers to the number of 27 were all connected to four steam-pipe mains that were laid up close to the fire; near each a water pipe was laid. Men were assigned to the steam and water pipes, and finally the barrier between the burning inclosure and the smokestack was torn down; the steam gang, with water playing on them to protect them from the heat, rushed forward and with the steam from 27 boilers literally drove the oil through the smokestack, thereby smothering the flames. From the pit at the far end the oil was pumped into containers.

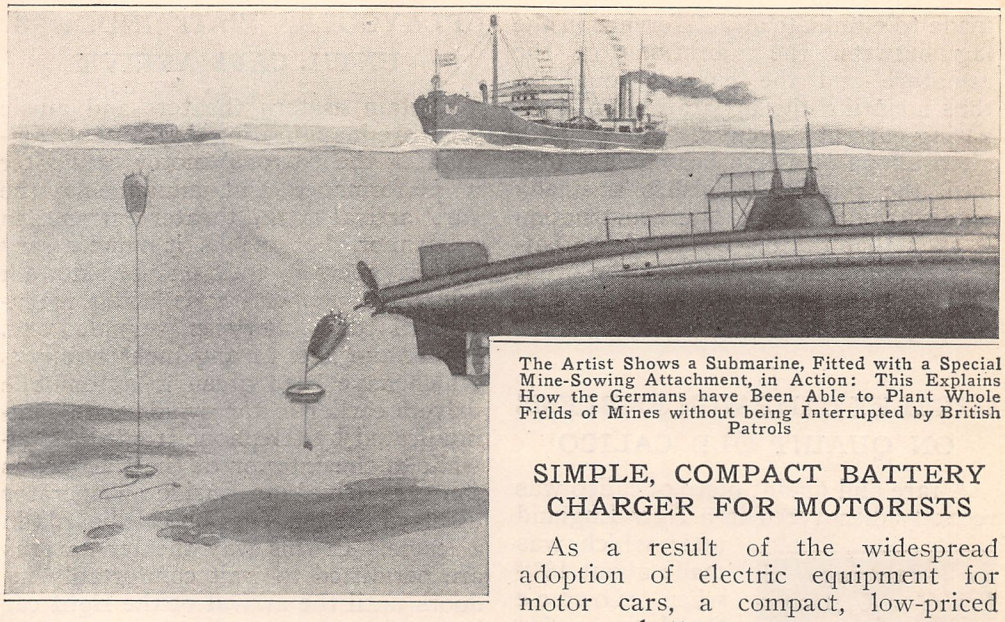
WICKER ADDS TO BEAUTY OF FLOWER HOLDER

Many new flower containers of pleasing design are now being inclosed in loosely woven wicker or reed. One of the most graceful of these is a tall, slender bud vase about which are twined a few strands of wicker, forming a very decorative coarse mesh. A handle of the same material extends in a long, sweeping curve from the neck of the vase to its base.



COURTESY OF THE LADIES' HOME JOURNAL

¶ According to London's new motor-car regulations, not only are all headlights prohibited, but in electric side lamps bulbs exceeding 12 watts cannot be used and the front glass must not exceed 6 in. in diameter. The whole front of the glass must be obscured with one sheet of white tissue paper.



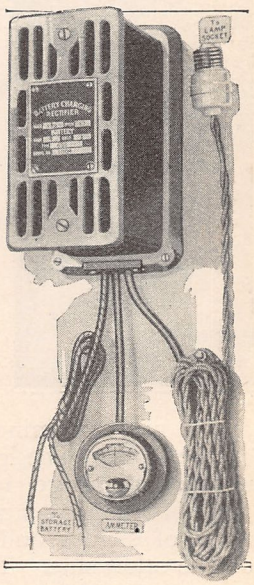
The Artist Shows a Submarine, Fitted with a Special Mine-Sowing Attachment, in Action: This Explains How the Germans have Been Able to Plant Whole Fields of Mines without being Interrupted by British Patrols

MINE-LAYING SUBMARINES OF GERMAN NAVY

German mine-planting submarines have been mentioned frequently in cable dispatches from Europe, but considerable vagueness has surrounded their design and method of operation. According to British advices, it appears that instead of being constructed especially for this one function, craft of the usual design are merely provided with a special apparatus which permits them to eject mines of the contact type. The sowing is done in a very simple way. A reel inside of a sinker holds a line attached to a floating mine. The lower end of a cord extending down from this sinker, or anchor, carries a plummet. When first thrown into the water from a submarine, the mine lifts to the surface as the line unwinds, allowing the anchor and the smaller weight to drop. When the latter strikes the bottom it locks the reel and prevents more line from being paid out. The sinking anchor then commences to draw the mine down with it, thus carrying it to the proper depth beneath the surface, where it remains out of sight until exploded or removed.

SIMPLE, COMPACT BATTERY CHARGER FOR MOTORISTS

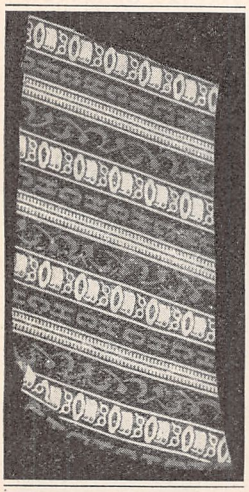
As a result of the widespread adoption of electric equipment for motor cars, a compact, low-priced storage-battery charger has been developed. It consists essentially of a step-down transformer and a magnetic rectifier mounted on a metallic base and incased in a neat housing. It may be connected with an ordinary house-lighting circuit and its positive and negative wires attached to the binding posts of any six-volt battery. As the line voltage is cut down properly for charging purposes, the current is passed through the rectifying element, consisting of a master-spring armature, carrying two opposite subsprings, to each of which is attached a copper electrode that makes and breaks the circuit with a carbon electrode. This causes all of the current to flow into the battery in the same direction. Arrangement is



made to eliminate any difference in the lag between the vibrations of the armature and the current reversals, thus adapting the apparatus for alternating-current circuits. Since both alternations of a line current are utilized, the rectifier furnishes a steady unidirectional flow. The construction is such that the discharge of the battery through the rectifier, in the event that the line current should be temporarily cut off, is prevented.

GREELEY CAMPAIGN EMBLEMS ON QUAINT OLD CALICO

A rare and quaint piece of calico was recently discovered in a New England attic which was made about 1872 when Horace Greeley ran for the presidency. Its pattern is suggestive of the picturesque campaign methods employed at that time. A tall hat of the style of post-bellum days, and a pair of heavy-bowed spectacles, both articles suggestive of Greeley, are the motif of the most prominent stripes printed on the cloth. The letters "H" and "G" appear in orange, in columns at one side of the hat and spectacles, and rows of sickles and axes are printed on the other side. These last emblems are supposed to suggest that the famous editor was also a farmer.



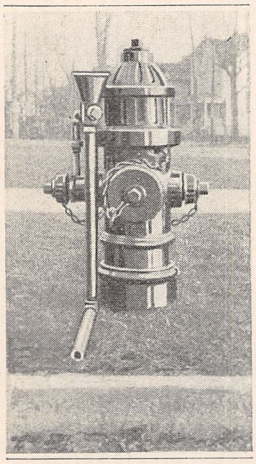
¶Experiments are being made in crushing and washing of matrix rock bearing platinum taken from a lode of dunite said to carry platinum amounting to about $4 per ton. If these efforts are successful similar lodes will be sought elsewhere.

PLAYGOERS WAIT INDOORS UNTIL CARS ARRIVE

Certain eastern theaters and music halls are inaugurating a system of summoning the patrons' motor cars after a performance and announcing the cars' arrival at the theater entrance in a manner that makes it unnecessary for playgoers to wait on the sidewalk while the proper car is being megaphoned or otherwise signaled to. Under the new arrangement numbers which have been given to automobile drivers earlier in the evening are communicated by telephone from the sidewalk to the interior of the theater, as the cars drive up. Inside an operator displays the numbers on cardboards in a frame. In this way theater patrons are permitted to wait comfortably indoors until the arrival of the right car is announced.

CITY FIRE PLUGS ARE USED AS DRINKING FOUNTAINS

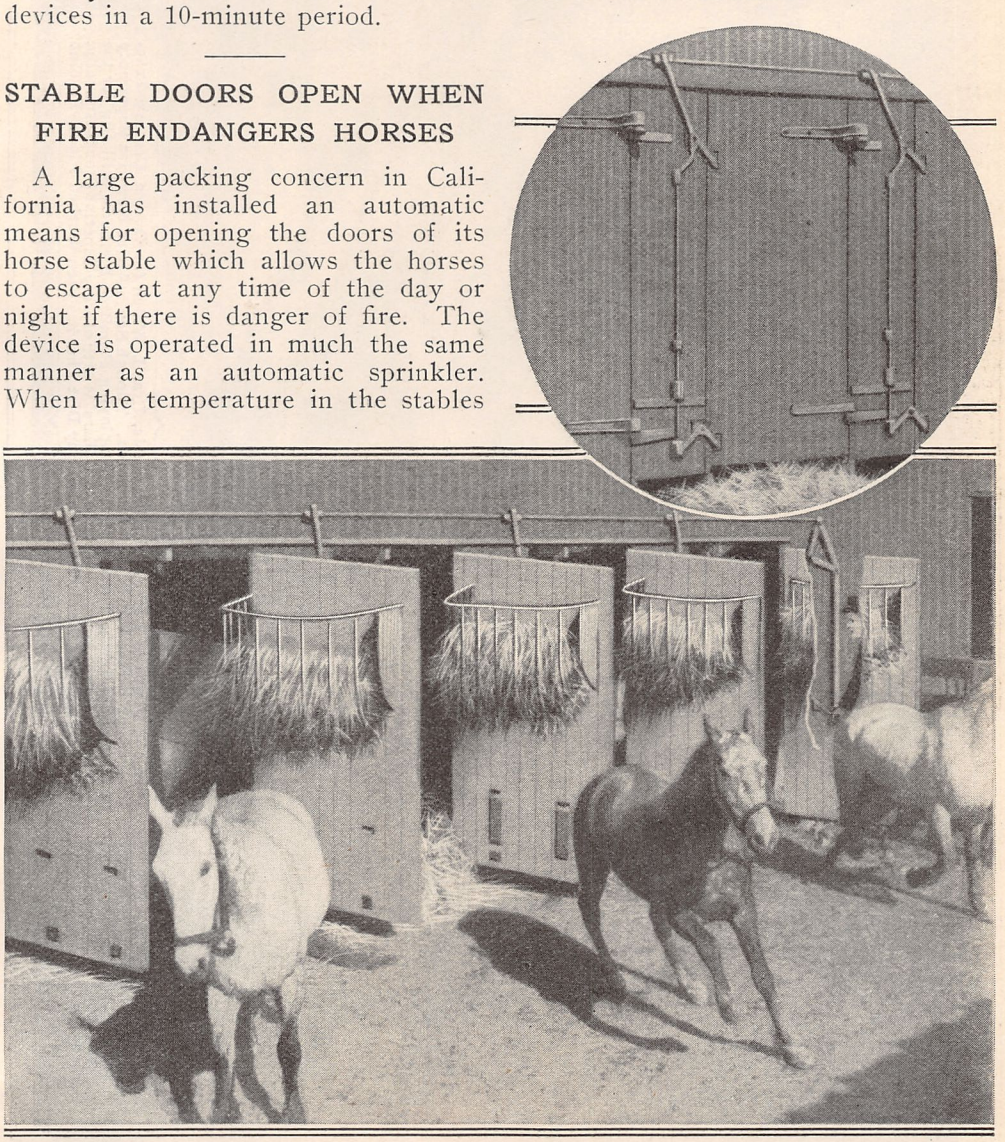
Sanitary drinking fountains designed to be attached to fire hydrants have been installed at a number of places in Rochester and New York City for the benefit of pedestrians. The device is an invention of an employe of the Department of Public Works of the former city and is being installed in Gotham by a temperance society and social-welfare organization in districts where a drink is a difficult thing for a person on the streets to get except in saloons and soda emporiums. The contrivance is of the bubbling-cup type and drains through a waste pipe into a gutter adjacent to the plug to which it is attached. It has



the advantage of being of little intrinsic value, a thing which safeguards it against unauthorized removal; and also of being easily and inexpensively installed. It does not interfere with the use of a hydrant in case of fire, and drains well, so that a puddle is not formed about its base. As an indication of the serious need for such fountains in cities, 40 New Yorkers were recently observed to use one of the devices in a 10-minute period.

STABLE DOORS OPEN WHEN FIRE ENDANGERS HORSES

A large packing concern in California has installed an automatic means for opening the doors of its horse stable which allows the horses to escape at any time of the day or night if there is danger of fire. The device is operated in much the same manner as an automatic sprinkler. When the temperature in the stables rises to a certain point a weight is released which falls on a lever that in turn releases all the doors simultaneously. At the same instant certain noises are made mechanically which frighten the horses from their places. The releasing lever is occasionally operated by hand to give the horses a fire drill. Each horse soon learns to trot from its stall when the door opens and the alarm sounds.



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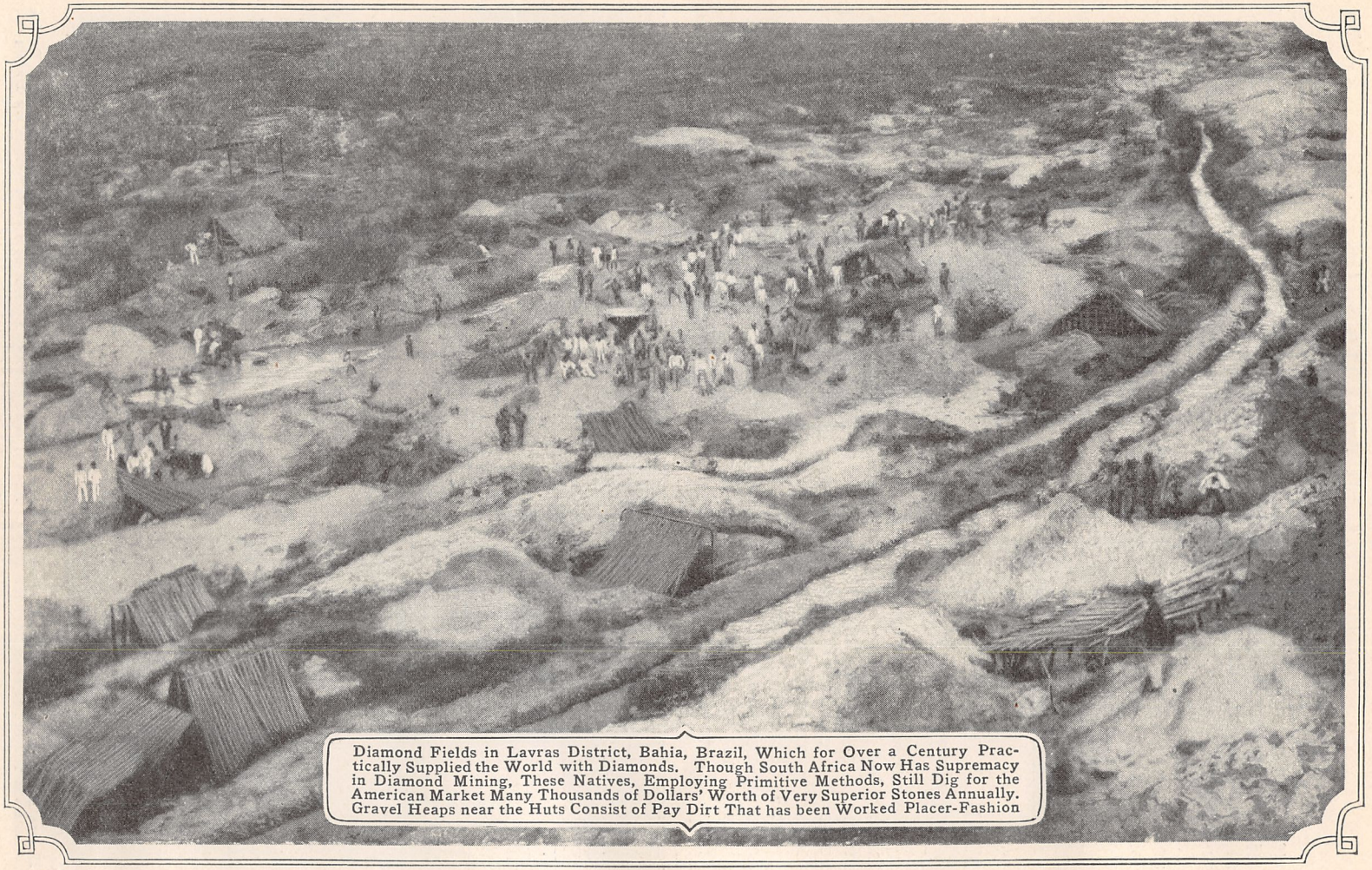
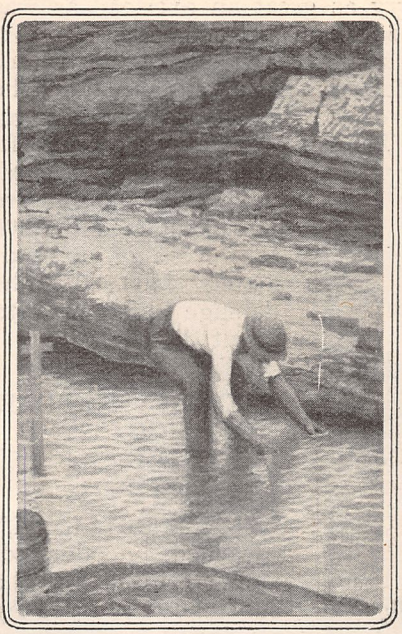
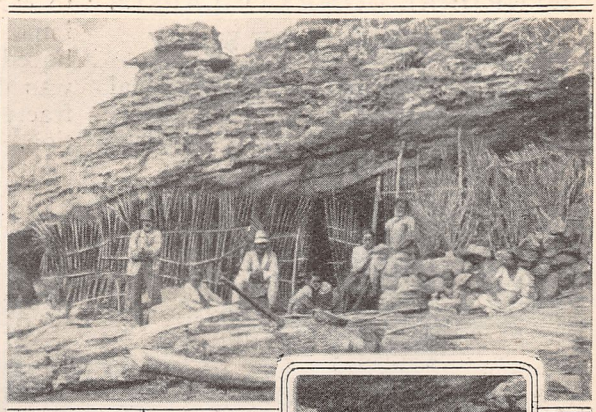
Horses Running from Their Stalls Just After the Doors have been Thrown Open by the Automatic Device and the Alarm has been Sounded Inside. Above: Stable Doors Locked by Levers Which are Drawn Back Automatically When the Temperature in the Stable Rises above a Certain Point



Diamond Fields in Lavras District, Bahia, Brazil, Which for Over a Century Practically Supplied the World with Diamonds. Though South Africa Now Has Supremacy in Diamond Mining, These Natives, Employing Primitive Methods, Still Dig for the American Market Many Thousands of Dollars' Worth of Very Superior Stones Annually. Gravel Heaps near the Huts Consist of Pay Dirt That has been Worked Placer-Fashion

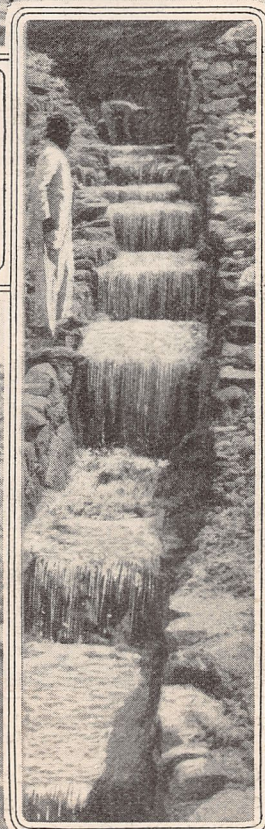
ANCIENT DIAMOND FIELDS PRODUCE MANY GEMS

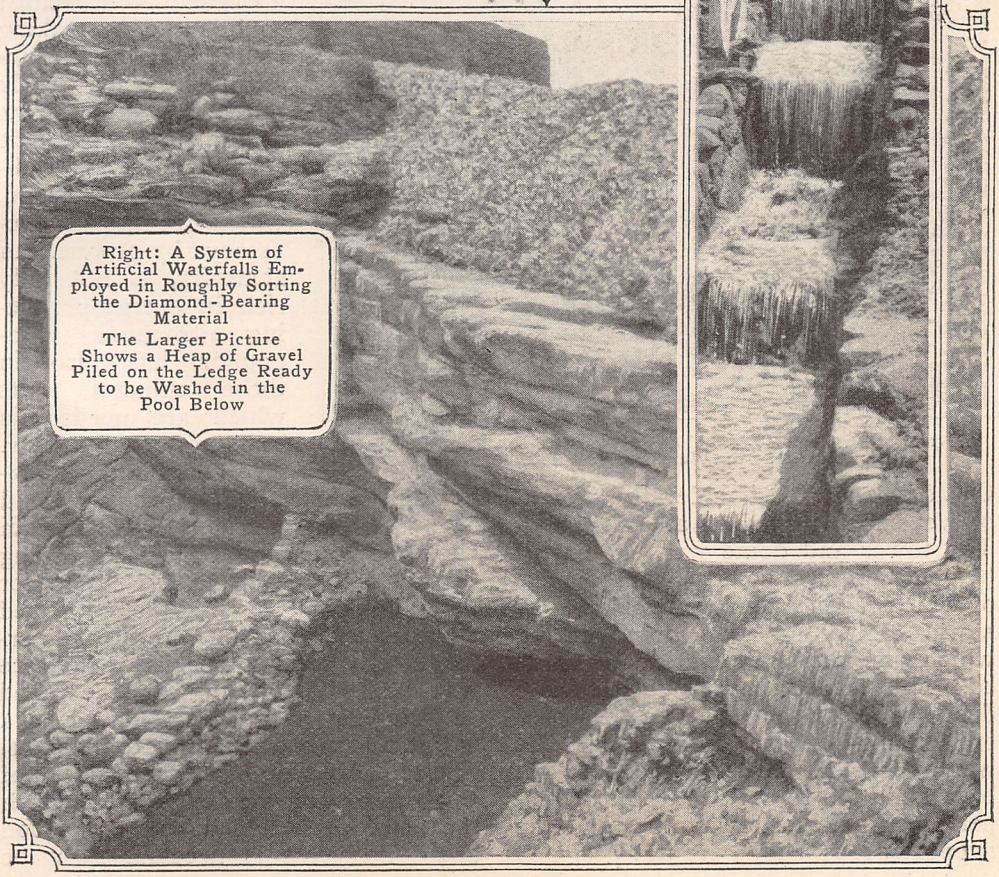




Above: A Cave in the Brazilian Diamond Fields Occupied as a Home by the Native Miners

Left: The Primitive Method Which the Miners Employ in Washing the Pay Dirt





Right: A System of Artificial Waterfalls Employed in Roughly Sorting the Diamond-Bearing Material

The Larger Picture Shows a Heap of Gravel Piled on the Ledge Ready to be Washed in the Pool Below

CATHEDRAL DOME COLLAPSES UNDER WEIGHT OF SNOW

As an aftermath of an exceptional blizzard at Seattle early in February, a 43-ft. dome crowning the St. James Cathedral collapsed under the weight of wet snow packed on all sides of it. The tower and dome were supported by four intersecting steel trusses, one of which failed under the strain. The storm lasted for 36 hours, during which time the wind continually shifted. This caused snow to be piled to a depth of about seven feet in the pockets around the base of the dome. The weight of this is estimated to have been about 30 tons. Seattle rarely experiences heavy snowstorms, and the supports, it is said, were not designed to carry as great an overload as was imposed upon them. It is also believed that steel in one of the trusses was defective, an examination of the fracture showing almost no elongation. The top of the dome was 115 ft. above the cathedral floor. The structure was completed in 1906 at a cost of approximately $400,000. The damage amounts to about $75,000.

Interior of St. James Cathedral at Seattle After Dome had Collapsed under the Weight of Wet Snow

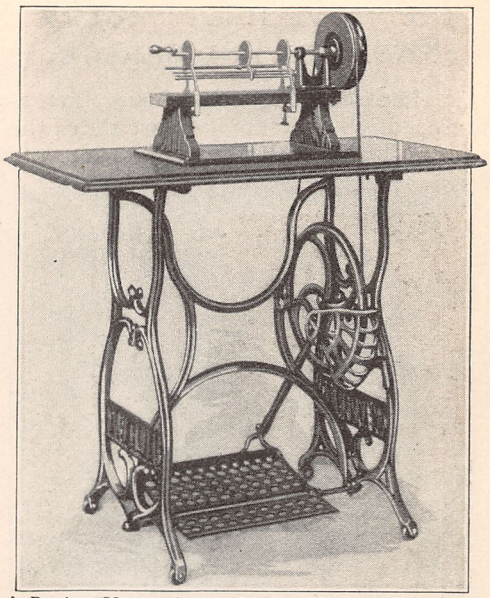
BLOOD INSTEAD OF EGGS AND MILK IN DOUGH

"Denatured blood," bleached, deodorized, and sterilized, is the substance proposed by a German food chemist to be used in making rich dough as a substitute for such highly nutritious ingredients as milk and eggs, the cost of which is steadily increasing. Blood, which occurs as a necessary by-product of abattoirs, is not only rich in energy-producing nitrogenous compounds but also in those mineral salts which are needed in building up the body. The bleaching, sterilizing, and deodorizing is done by the aid of hydrogen peroxide. The German chemist claims to have been using this "blood bread" in his home for several years. At first he employed a 30-per-cent solution of ordinary peroxide, but later a special perhydrite was used. After allowing the blood to cool for a day or a day and a half it is strained to eliminate the clots. The remaining liquid is used instead of water in mixing the dough, after which the peroxide is added. In this blood bread no yeast is necessary, as the

liberated oxygen permeates the mass with the same effect as is produced by growing yeast. This oxidizing agent also destroys objectionable bacteria in the flour. The prepared blood is good, it is said, not only for bread, but for biscuits and cakes as well.

BANDAGE ROLLER OPERATED LIKE A SEWING MACHINE

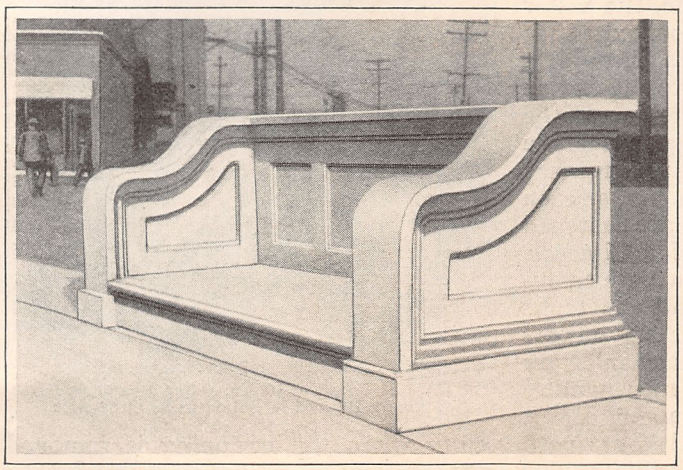
An invention that doubtless has been prompted by the war is a bandage-rolling device which can be attached to any sewing-machine frame of new or old design. The treadle and lower belt wheel of the machine are used to operate the new attachment. This consists essentially of a shaft on which the bandages are wound. To it is rigidly attached a grooved wheel which is connected with the wheel below by a belt. At the opposite end is a crank handle for starting the machine by hand. On the shaft are movable guides which can be set for bandages of any width. If desired, the bandages can be caused to pass between bars set close together, thereby removing wrinkles before the cloth is wound. The attachment is fastened to wooden supports, which in turn are screwed to the sewing-machine top.



A Device, Mounted on a Sewing-Machine Frame, on Which Bandages of Various Widths can be Wound

PERMANENT PULPITS BUILT FOR STREET SPEAKERS

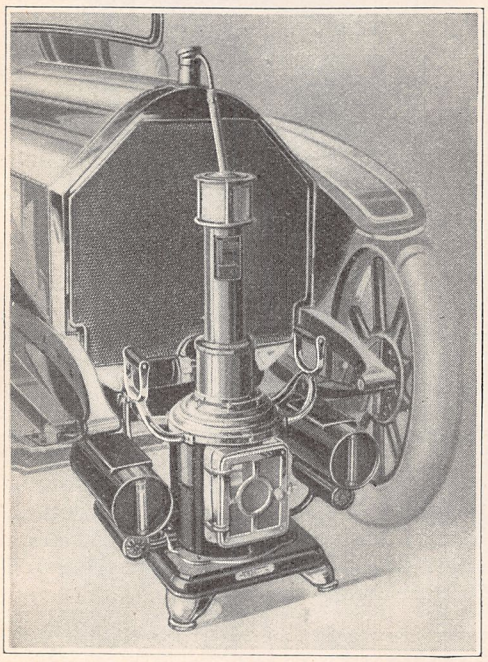
Before a plaza in one of the public parks at Los Angeles, two concrete rostra have been erected for the open-air speakers who frequent the place and attract crowds of people of many different nationalities. These men talk on various phases of political and religious subjects in any one of a half dozen languages, while the audiences assemble in the broad street surrounding the park almost as did the ancients in the days of the Forum at Rome. The continuance of this practice has caused the city to construct permanent pulpits for the speakers, who are free to use them at will. Each of these is built on somewhat classical lines and is 11 ft. in length and 3 ft. 8 in. in height. The platform in both instances is elevated 10 in. above the sidewalk level.



Concrete Rostrum Erected for Public Speakers before a Plaza in One of the Parks of Los Angeles

OIL STOVE HEATS MOTOR RADIATOR AND GARAGE

A kerosene stove is being manufactured which heats and circulates the water through the water jacket and

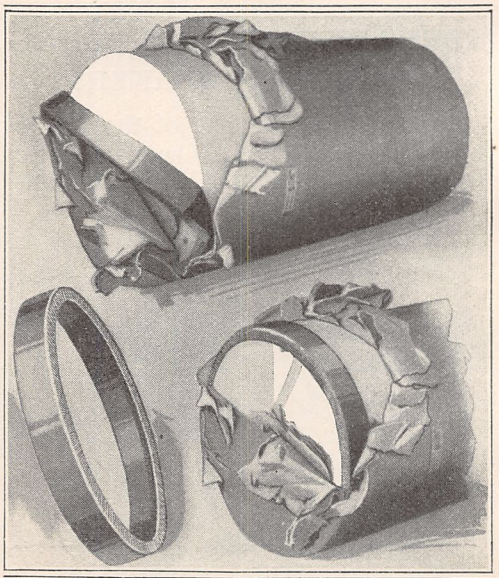


This Stove is Connected by Tubes with the Car Radiator, and will Keep the Water in It Warm and Circulating for 36 Hours, or More, by Burning Two Gallons of Kerosene

radiator of a motor car while in a garage. It is so devised that by connecting it with the radiator drain cock, by means of a rubber tube, the water flows into a copper coil located above the flame, whence it rises through a pipe which carries it back to the engine through the opening in the top of the radiator. In external appearance the stove somewhat resembles an ordinary oil stove except that two tanks, each with a capacity of 1 gal., are fastened to the frame either side of the burner. These feed through intermediate chambers, making it safe to fill the tanks when the heater is lighted. Oil gauges are fitted to one end of each tank. By means of two rigidly fastened handles the stove can be moved about easily. It will burn from 36 to 48 hours with one filling. The burners give a blue flame which produces no carbonizing. As a safeguard against explosions due to outside gases, the flame is thoroughly protected with a safety screen similar to that used on a miner's lamp. The stove gives off a good deal of surplus heat which moderates the temperature of the garage, thereby benefiting the car as a whole. Other designs of this stove employ gas and electricity.

SHEET-IRON BANDS PROTECT EDGES OF PAPER ROLLS

To protect heavy rolls of paper from injury during transportation, crimped sheet-metal bands are being used to bind the ends. These members are slightly smaller in circumference than the rolls and when snapped in place at a mill fit very tightly. They have a twofold advantage, for not only are the edges of the paper safeguarded, but the handling of the rolls is materially facilitated. Newspaper stock and similar paper can be loaded on end in cars without deleterious effects, and trucking is likewise made easier. The bands can be slipped off without difficulty when the wrapping is removed preparatory to swinging a roll into a press.



The Ends of a Roll of Paper, When Bound, are Not So Easily Injured in Shipment as Otherwise

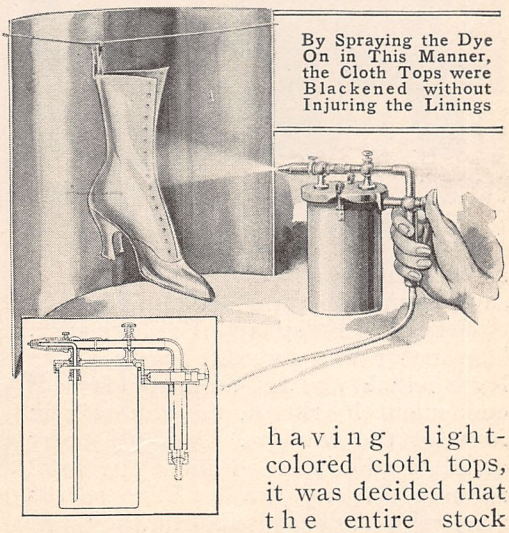
With This Grain Loader Fewer Wagons are Needed to Supply Grain to a Threshing Machine and No Laborers are Required to Pitch Bundles onto the Wagons

GRAIN LOADER DOES WORK OF HARVEST HANDS

A labor-saving agricultural machine has been developed which dispenses with harvest hands employed in the field in loading grain to be stacked or to supply a threshing machine. It is called a shock loader and will fill a wagon rack in less than two and a half minutes. It weighs 2,800 lb., is drawn by four horses, and is operated by the driver alone. The principal parts of the machine are the "pickers" and three carriers. The pickers, whose position is analogous to that of the cutting knives on a binder, lift the bundles of grain and deposit them on a carrier by which they are transferred to a horizontal carrier at the rear; from this the grain is raised on an inclined elevator and dropped into wagons which move alongside the machine. The pickers are 6-in. spikes fastened to a 6-ft. steel bar. They grasp the bundles and the turning of the bar deposits them on the carrier. The pickers also gather up the loose grain about the shocks. A 20-in. drivewheel operates the carriers, pickers, etc. The machine will do the work of several men pitching bundles in the field and can load six wagons fast enough to supply a threshing outfit as rapidly as 12 wagons can under the old method. This loader is also used advantageously in loading alfalfa, for it does not shake off the dry leaves, as is done in hand loading.

CLOTH SHOE TOPS ARE DYED BY COMPRESSED AIR

When one of the large manufacturing companies found some time ago that it was oversupplied with shoes having light-colored cloth tops, it was decided that the entire stock should be dyed black. In order to accomplish this without discoloring the



By Spraying the Dye On in This Manner, the Cloth Tops were Blackened without Injuring the Linings

linings and ruining the internal appearance of the shoes, a special dye was made and applied by means of compressed air instead of a brush. The device is similar to some of those employed in spraying paint, and practically the same in general principle as an atomizer. The shoes were suspended from a line stretched in front of a screen while being worked upon. The work was done quickly, neatly, and without injuring the linings.

LEVER IN STREET OPERATES MOTOR IN SHOW WINDOW

An unusually effective method of demonstrating the operation of an electric motor that was displayed in a

By Means of This Foot Lever in Front of His Show Window a Pittsburgh Dealer Allowed Passers-By to Operate the Electrically Driven Sewing Machine on Display Inside

show window as an attachment for a sewing machine, was employed by a dealer in Pittsburgh, Pa., recently. The motor was connected with a foot lever which was set on a standard of convenient height on the sidewalk in front of the window. Any passer-by could set the machine inside the store running at any one of five speeds simply by placing his foot on the lever. Placards either side of the machine invited spectators to use the lever.

HICKORY IS USED AS STOCK BY PECAN GROWERS

By uniting the scions and buds of the pecan with the hickory tree, attempts are being made to carry it into districts in which it is not commonly grown and where the latter tree abounds. Since the hickory is very sturdy and also closely allied to the pecan, it has been considered probable that in certain localities it would serve advantageously as a stock. The plan apparently permits the quick introduction of the pecan into new places and, it is hoped by some, may enable the conversion of inferior nut-bearing trees into good ones. Grafting of this character has been done in Louisiana, Florida, Oklahoma, California, and other places, for experimental purposes and kindred reasons. In Florida the pecan has been found to unite readily with the mockernut and grow quickly, until a certain stage is reached, where the progress slackens. According to the Department of Agriculture, other hickories have been tried in different places, and while the early growth in many instances has been strong, few of the trees have borne satisfactorily. It has not yet been fully determined whether the cause of this unfruitfulness is attributable to the influence of the hickory stock or to a lack of cultivation. Recent reports from Oklahoma seem more encouraging. In certain districts the experiment has apparently proved profitable. The grafting there is said to have been done in the spring of the year, to young hickories which had been girdled in the fall. One of the best authorities in the country asserts that there is no reason to believe that such a process will of itself produce better nuts, regardless of the stock, unless the very best varieties of pecans are used. He also points out that the pecan will freeze as quickly on one root as on another, and that therefore the hardiness of the hickory makes no difference in that particular. Although still largely experimental, it appears that in some localities the plan can be followed successfully.

FIRE DESTROYS MANY SHIPS LOADED FOR ALLIES

THE fact that large quantities of munitions of war for the allies were being loaded onto ships at the foot of Pioneer Street, Brooklyn, is believed to have been responsible for the mysterious $5,000,000 fire which broke out February 16 among these ships, partly or wholly destroying three large vessels and 37 lighters and barges. The fire was preceded by several unaccounted-for explosions. The havoc wrought on the New York Dock Company's 900-foot pier is shown at the left. Below is a view of the "Bolton Castle," showing a decided list due to water pumped intoits hold by the firemen.

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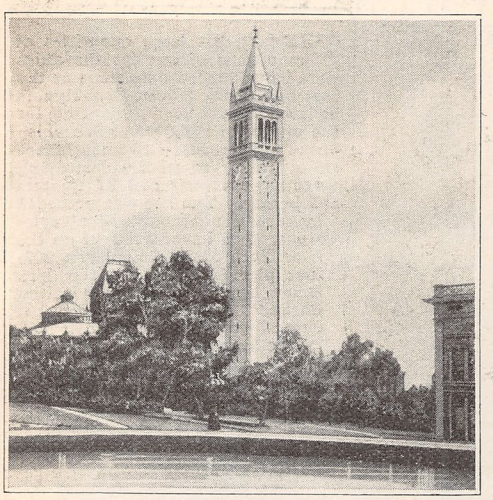
COLOSSAL CAMPANILE BUILT ON PACIFIC COAST

One of the most beautiful campaniles of modern construction that is to be found anywhere has recently been completed at the University of California, where it rises to a height of 302 ft. above the campus. It has been erected in honor of one of the patrons of the institution and is probably, with the exception of the Washington Monument, the highest memorial tower in America. As explained in the December, 1914, issue of this magazine, the structure has been designed to resist seismic disturbances. Its concrete foundation, laid on bedrock, is 48 ft. square and 8 ft. thick. The frame of the building is of structural steel. In order to avoid rigidity, cross bracing was eliminated in alternate stories. The campanile is 34 ft. square at the ground and tapers to 30 ft. at the loggia, or observation portico, which is at a height of 200 ft. and is reached by stairs and an elevator. Immediately beneath the latter point is a clock with

dials 16 ft. in diameter. The chimes, costing $25,000, will hang above the loggia. The pinnacle of the tower is

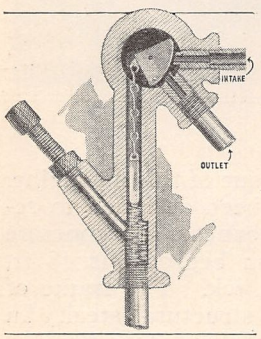


Three-Hundred-Foot Campanile on University of California Campus Built to Resist Earthquakes

crowned by a bronze lantern of pleasing form, the light of which is visible at night from the decks of ships entering the Golden Gate.

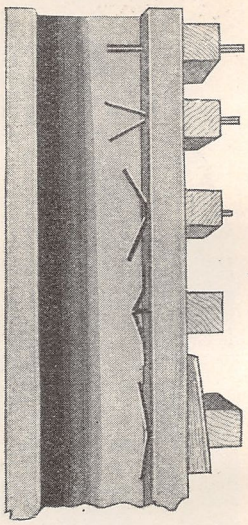
LINOTYPE HEAT REGULATOR SAVES GAS

A gas flame is used on linotype machines to keep the supply of type metal melted. Often the metal is heated to a higher temperature than is necessary, resulting in a waste of gas. To prevent this automatically a new regulator has been devised. It is mounted at the upper end of a metal pipe containing a column of mercury. The mercury is affected by the heat of the type metal, rising and falling with changes in temperature. A float rests on the upper end of the mercury and with the aid of a small chain operates a pivoted valve. When the float rises unduly, due to too high a temperature in the type-metal bath, the pivoted valve swings over and rests against the gas-intake port, lessening or cutting off entirely the fuel supply. When the metal cools down, the mercury recedes and gas is again allowed to flow. A setscrew in the side of the regulator pushes against the mercury column, and with it the height and temperature range of the column may be adjusted.



SELF-CLINCHING NAIL IS NEW TYPE OF FASTENER

A fastener of entirely different principle from ordinary types has lately made its appearance upon the market. It is intended to hold anything together from two pieces of hard leather to metal lath against a hollow-tile wall. Only a hammer is needed to drive these "nails" home, a screwdriver or other tool being unnecessary.



The fasteners are made from a narrow strip of metal bent to a double "U" shape, the various folds being flattened out and properly shaped in the stamping machine. In use, the longest end of the fastener is placed in the hole and the other end struck with a hammer. This results in forcing the extra length of the "nail" through the hole, causing it to bulge out on the other side, the bulge taking on a more or less flattened shape due to depressions in the center portion of the fastener. After being driven home, this center portion acts merely as a wedge to hold the bent-over sidepieces in proper place. It is unnecessary to use any clinching device on the side opposite the

Blind Civil-War Veterans in the National Library for the Blind Marking Playing Cards for European Soldiers Who are Similarly Afflicted. Sightless Women Knitting for the Sufferers of Europe

hammer, the bending over being entirely automatic.

Two general types are manufactured, one rather short and stiff for uniting two pieces of metal, leather, or similar stiff articles. The other style is long and slim, and intended to have greater holding power in fastening metal lath or the like, to irregular tile or terra-cotta walls.

BLIND CIVIL-WAR VETERANS SUCCOR EUROPE'S BLIND

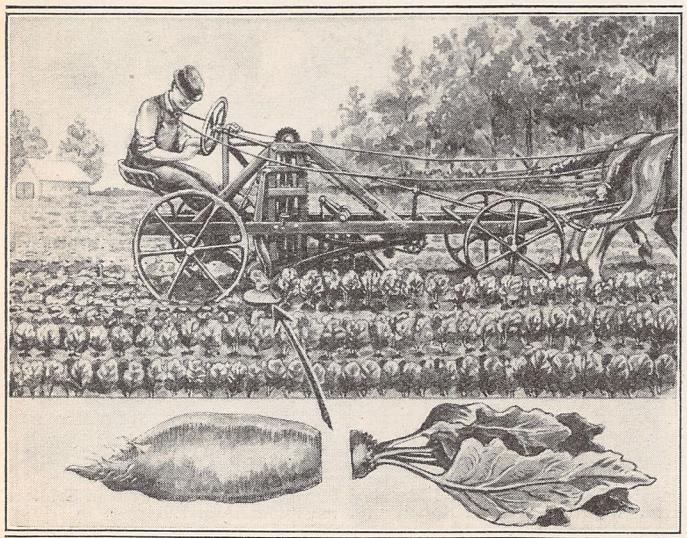
Blind Civil-War veterans and blind women are regularly engaged in preparing games and bandages for the sightless soldiers in Europe in the National Library for the Blind at Washington. Several blind old soldiers mark playing cards for the use of European soldiers who have lost their sight. This is done by perforating or stamping the pieces of cardboard so that they can be recognized by the touch. Either a small instrument similar to a punch is used, or a machine not unlike a typewriter, which is also employed in writing letters for the blind. A number of sightless women knit small articles to be used in dressing wounds. These take the place of absorbent cotton, which is very scarce. These loosely knit articles can be used many times if properly cleansed.

MACHINE FOR TOPPING AND HARVESTING BEETS

What appears to be a practical machine for topping and harvesting sugar beets has been invented and patented. The fact that there is a standing prize of $10,000, offered by one of the leading American sugar companies for a successful beet harvester, is evidence that such a machine meets a real need in the beet-sugar industry, while the shortage in imports from abroad, with the resulting rise in prices, still further accentuates the importance of any machine that will reduce the cost of producing sugar in this country.

This new machine is mounted on a light truck and is designed to be pulled by horses or propelled by engine power. It consists of a topper and puller with elevators that drop the topped beets in rows or piles, as desired by the operator, the entire mechanism being driven by the rear wheels of the truck. One of the difficulties in devising a beet-harvesting machine is the necessity for cutting the tops at

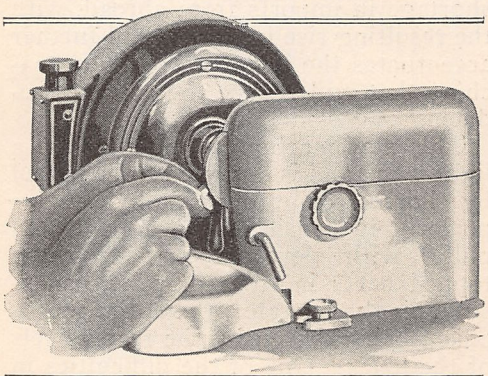
varying heights, the requirement being that a large beet must be cut lower than a small one. This difficulty is overcome by an ingenious measuring device that controls the height of the topper, which consists of two horizontal disks driven at a high rate of speed. One feature of this control is an endless belt with its lower side moving backward with reference to the movement of the truck. This belt bears against the tops just hard enough to thrust them against the disks, and adjusts itself automatically to varying heights of the plants. The diameters are measured by two shoes that pass along the two sides of each plant as the machine is pulled along the row. These two devices, acting in conjunction, control an automatic mechanism that raises and lowers the disks. Following the topper is the puller, which lifts the beets from the ground. The beets are then raised by an elevator, conveyed to the side of the machine, and dropped in rows or piles on the ground.



Sugar Beets are Topped, Removed from the Ground, and Piled in Rows as the Harvester is Driven Along. The Arrow Indicates the Cutting Disks

DENTAL GRINDING MACHINE SAVES GOLD DUST

For the benefit of dental practitioners an efficient, power-driven grinding tool embodying a number of attractive features has been developed. It is intended as an attachment for a dental lathe, and is arranged so that it collects and saves the particles of gold often wasted in finishing crowns, bridges, and inlays. A fine carborundum wheel is kept properly moistened to prevent the overheating of porcelain work. A truing device, which is brought into action by drawing a small lever back and forth a few times when necessary, provides a ready means of keeping the stone smooth and in alinement. Immediately in front of the wheel and designed as an integral part of the housing is an arched bed which forms a support for the operator's hands. Held in a belt arrangement inside of the device, so that it comes in contact with the wheel, is a rubber sponge which wets the stone and collects the gold particles from it. This passes down through a tray of water at the bottom and then between rollers which remove the superfluous moisture and grindings.



The Dental Grinding Attachment in Use, Showing Its Position in Relation to the Motor

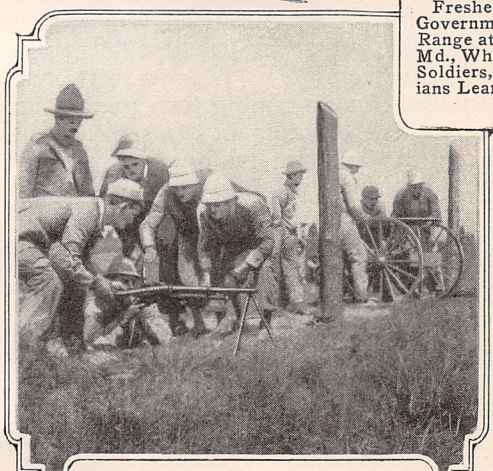
A SCHOOL FOR MARKSMANSHIP

By JOHN R. COX

AN inconspicuous speck on the newer maps serves to denote the location of Winthrop, Md. A bold headland jutting on the Potomac River, between two of its tributaries, it attracts little notice from the thousands of passengers on that picturesque stream, a two-and-a-half-hour sail below Washington. Very few tourists on the river steamers realize that they are passing a place of any consequence. Yet, despite its modest position in the atlas, Winthrop is a significant factor in our system of military effectiveness, for it is the base of small-arms marksmanship of the United States Navy and Marine Corps.

Winthrop derives its name from a former assistant secretary of the navy, Beekman Winthrop, who did much to encourage the promotion of small-arms shooting in the marine corps. The tract, comprising 1,100 acres, was formerly known by the uneuphonious name of Stump's Neck, but since it has been given the dignity of a government station, it is officially designated as the Marine Rifle Range, Winthrop. Its isolation affords ideal facilities for the work in which it is engaged.

Practice after a Freshet on the Government's Rifle Range at Winthrop, Md., Where Sailors, Soldiers, and Civilians Learn to Shoot



Giving a Lesson in the Use and Construction of Rapid-Fire Guns so That the Mechanism of the Pieces is Thoroughly Understood

Rear of the Target Butts at Winthrop with Which All must Become as Familiar as with the Use of Various Small Arms

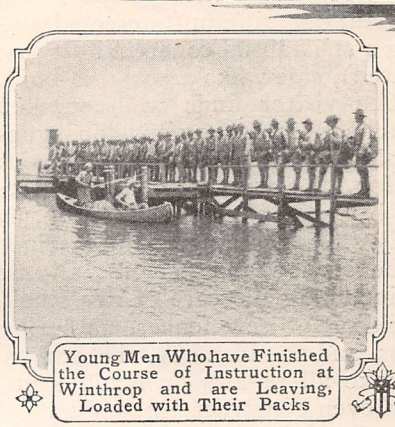
Every newly enlisted man in the eastern division of the marine corps must undergo the course at Winthrop, and qualify before he is assigned to general service. As these recruits mostly come from the interior with little or no previous experience with the rifle, they have a great deal to learn; but two weeks of intensive instruction works wonders with them, and they are sent to marine detachments with an excellent working knowledge of the use of small arms, and no longer "gun-shy."

But Winthrop is not merely a rifle range. It is also a school for coaches in rifle and revolver shooting; and it is there that the foundation is laid for small-arms practice in both the seagoing services of the United States' fighting force. Sailors, from chief petty officer to ordinary seaman, are detailed from naval vessels in squads of ten men each during periods when they can best be spared from their respective ships without interference with the ship work. This branch of training is fully as important as the instruction imparted to recruits. Indeed, it may be said to be the main object of the station, for it is technically known as the Navy School for Small Arms Coaches. Teaching these men to shoot, while very essential, is only incidental to the primary purpose of educating them to be able to coach others on board men-of-war and at naval stations. When the men undergoing the course have completed the regular period of instruction, they are turned out well-rounded small-arms experts, competent to perform any work on the range, the salient idea being to provide a coach for every firing point, and to qualify men to handle the rifle butts and to direct the firing line. Especially are they trained for duty at the big range at Guantanamo, Cuba, where the entire Atlantic fleet assembles each winter for practice.

But the activities at Winthrop are not confined to the instruction of marine recruits and the education of small-arms coaches. The range is open to all who desire to learn to shoot, and civilians are welcomed if they evince a sufficient interest in the serious business in which the station is engaged. High-school cadets, militiamen, shooting clubs, and other organizations, as well as individual citizens, may go to Winthrop and be instructed in the art of shooting. They are assigned coaches who teach them how to handle the rifle and revolver, and they fire the regular courses. They are supplied with guns and accessories for shooting; more than that, they are equipped with shooting clothes, and are even given a nominal pay of 30 cents a day, with tent, mattress, and blankets free. This feature of Winthrop is already attracting the attention of the young men of Washington, and it is predicted that by next season there will be no lack of applicants for the privilege which the range affords.

The training of civilians to shoot is in a sense experimental, but if it proves popular, as it now promises, the work will probably be extended. Capt. W. C. Harllee, U. S. Marine Corps, Assistant Director of Target Practice of the Navy, who is assigned to the small-arms section of that office, and author of the "Firing Regulations for Small Arms in the U. S. Navy," has evolved a plan whereby the facilities for learning to shoot, now offered civilians at Winthrop, may be extended to embrace all parts of the country. His plan is to utilize the several state rifle ranges for the training of citizens to shoot. Instead of maintaining these ranges for a month's shooting in the summer, he would keep them employed throughout the open season. Sixty soldiers would man a range of 20 targets, furnishing sufficient men to serve as coaches, markers, target men, telephone operators, cooks, and for other duties incidental to the operation of the range. Civilians living in the vicinity of the range would thus be encouraged to fire the regular courses, and upon qualifying, they would be registered as marksmen at Washington, and a certificate to that effect issued to them. As a measure of preparedness, the plan has much to commend it. The expense would be

A Marine Team Firing Prone on the Ground at 600-Yards Range. Score Boards are Shown Also



Young Men Who have Finished the Course of Instruction at Winthrop and are Leaving, Loaded with Their Packs

There Is a Good Deal of Ordinary Hard Work to be Done at Winthrop: These Men are Taking Their Turn at Keeping the Camp Clean

inconsiderable as compared with a large standing army, and there would be a minimum of interference with civic vocations.

The routine of instruction at Winthrop is very simple. The men attend school daily except Sundays and legal holidays. A regular program of lessons is followed, covering navy small-arms firing regulations, the marine corps and army textbooks. The practical school work includes, among other things, the task of taking apart and putting together, under instructors, the parts of rifles, automatic pistols, machine guns, and 3-in. field guns.

The scope of training navy coaches covers not only navy courses, but also army and marine-corps courses, so that the navy corps of instructors will feel when they have completed their instruction that they know the business of small-arms firing from all angles, even to instruction in estimating distances.

Sailors under instruction shoot not only the regular navy-qualification courses, but also those of the army, with pistol, machine gun, collective fire, national-match course, long-range firing, etc. They perform all coaching in navy courses, even when the marines fire, and they are also sometimes employed in coaching in the army courses.

After the first week of instruction the men themselves coach every day for a half day, attending school for the other half-day periods. They acquire practical experience first in marking in the butts and in scoring on the firing line, and later in commanding the butts and firing line, telephone service, and, in short, every detail of range work.

The men from the ships are expected to bring only their blankets and old clothes. Any kind of shooting clothes goes at Winthrop. There are no parades and no pomp and circumstance at the rifle range, nothing but hard work and plenty of it, but interesting

withal. Upon arrival they are issued tents, cots, mattresses, and all equipage which will be needed at the range. They are accorded all the privileges of the place enjoyed by the permanent corps of instructors, including the facilities of a well-appointed post exchange, use of canoes on the back river, fishing, baseball, and the like. The messing arrangements are splendid. the station maintaining its own garden, poultry farm, and dairy. A drove of thriving pigs gives promise of fresh pork and bacon. Plenty of fresh milk and eggs are supplied from the station farms, and the robust hunger induced by a half-day's steady drilling is abundantly satisfied with appetizing food.

Notwithstanding the very strenuous grind, the boys like it and become keenly interested in their work. It is not unusual for members of the squad to ask in a body to remain over with the next succeeding party, foregoing their furlough in order to extend the period of instruction beyond the allotted time. These stay-overs become in turn a part of the faculty.

One of the gratifying results of the system in vogue at Winthrop is the good feeling which prevails between the bluejackets and marines. The traditional hostility commonly supposed to exist between these two arms of the service does not prevail.

The working garb of all is reduced to a dead level of uncomeliness, consisting mostly of dungarees, old shirts, and marine campaign hats. A conspicuous feature of the range is its democracy. Officers and men, marines and bluejackets, fire under practically identical conditions. The marines have demonstrated that they like to have bluejackets coach them, because the sailors are enthusiastic and come well prepared to teach the work. The absence of ship drills is appreciated by sailors fresh from the fleet.

Besides the instruction of regulars, arrangements have been made to detail, from each battalion of navy militia, during the summer and fall two petty officers for a two weeks' period of coaching. Under the navy firing regulations, no distinction is made, the militiamen firing under exactly the same conditions as the sailors and marines.

A feature of Winthrop which deserves special attention is the manner in which it was constructed. The entire station was built by enlisted marines—roads were graded, a telephone system installed, water and sewer systems laid, the old farm buildings repaired and new ones constructed, ranges laid out, rifle butts erected (including a substantial concrete butt just completed), sidewalks and docks built, etc. The visitor finds well-equipped carpenter shops, blacksmith shops, gunsmith shops, and plumbing and paint shops for all classes of repairs. The range, by reason of its isolation, is virtually self-sustaining. The marines man the station and perform all the work, including the care of live stock, the building of new fences, gathering of crops, and the like. At the armory they make all repairs on small arms, and can even construct a new gun.

The officers in charge of the school emphasize the fact that no man should desire to remain away because he knows nothing of small-arms firing. The less the men know about shooting before they go the better, the instructors say. They then have nothing to unlearn. No man can undergo the course of instruction at Winthrop without becoming well qualified in the use and the mechanism of the rifle and pistol.

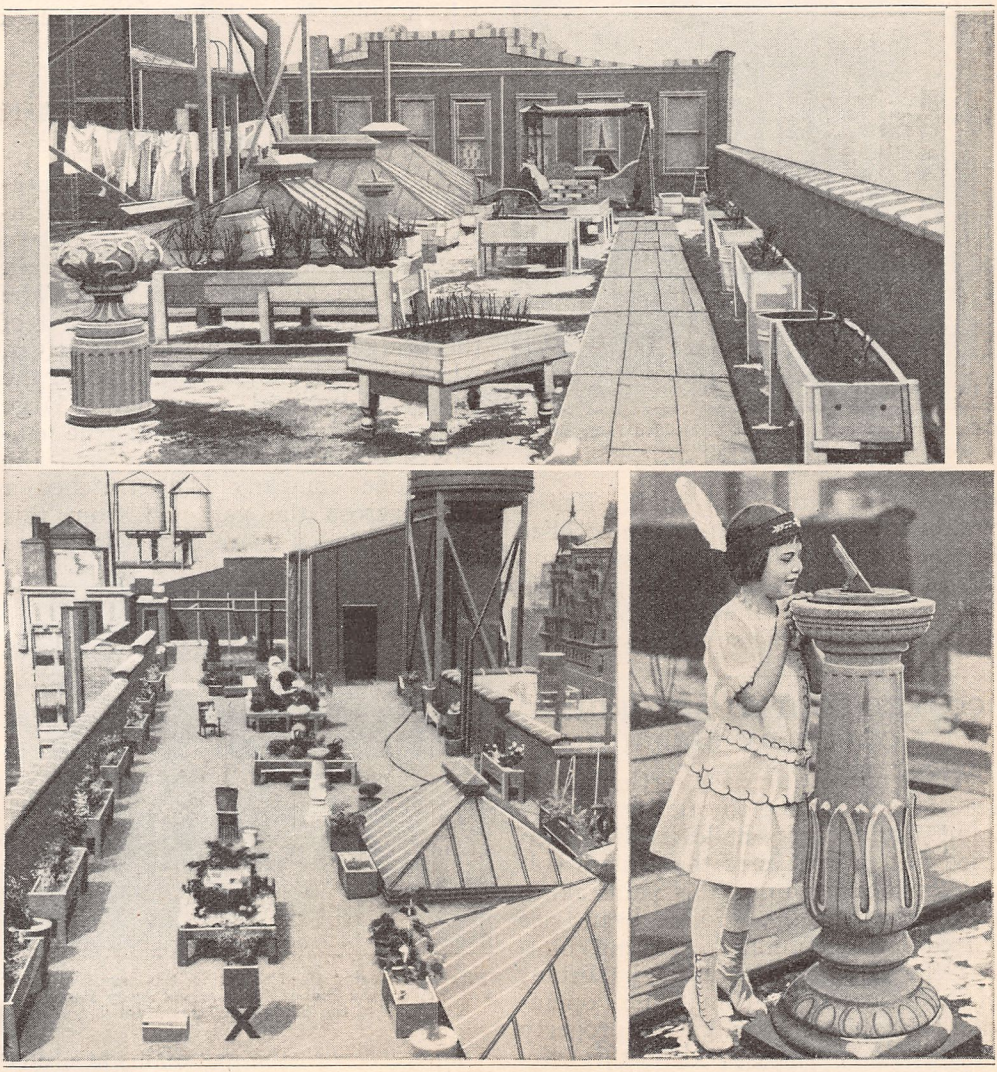
SKYSCRAPER ROOF USED FOR GARDEN AND HENNERY

What is declared to be a very successful substitute for suburban life is enjoyed by a family which occupies a six-room suite constructed on the roof of a 20-story building just off Broadway, New York. The head of this family is superintendent of the building, and it is he who has transformed the flat roof into a yard and garden. In numerous boxes filled with earth are grown flowers and vegetables. Tobacco

and cotton are also being experimented with. In one corner of the "yard" is a coop and runway in which chickens and ducks are kept from early spring until late in the fall. A sundial and vases lend an artistic touch to the lofty retreat. At the close of the day when work in the big building is done, one may find the superintendent enjoying an hour before sunset digging among his plants or attending to the needs of his feathered friends just as though he were in the country.

NOVEL MOLDED ICING ON WEDDING CAKE

An elaborately iced wedding cake was recently completed by a Georgia woman after five days of labor which illustrates the manner in which icing is now modeled or molded instead of being applied so as to make merely embossed patterns. The artistic piece of confectionery is pure white. From its sides hang scores of white strands, or festoons, on which are fastened hearts



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Flowers, Vegetables, Cotton, Tobacco, and Even Chickens and Ducks, are Raised in This Substitute for a Suburban Yard Located on the Roof of a 20-Story Building

of icing. An open-work basket of molded icing surmounts the cake. This is surrounded with ferns, tuberoses, etc., all fashioned by hand and spread

Cake Decorated with Modeled or Molded Icing Which Affords Many Opportunities for Producing Striking Effects

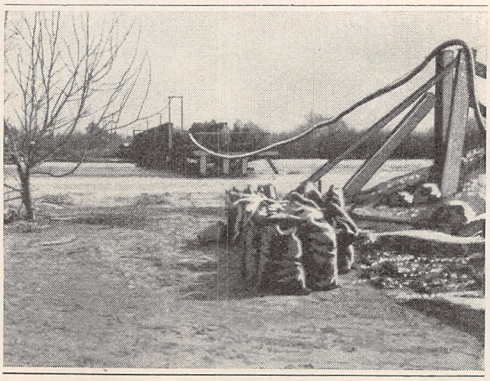
over the top of the viand. Rising within the basket is an array of lilies of the valley, daffodils, roses, and leaves wrought with skill and patience. The standard of the cake holder is decorated with icing and a bow of tulle.

COFFEE SORTED ACCORDING TO COLOR BY SELENIUM

At the present time the sorting of coffee beans according to color is done by hand, but recently a device has been tried out in certain of the British colonies which performs this painstaking task automatically. Coffee beans are sorted both according to size and color, but the latter is the more important of the processes. This machine's operation is based on a well-known property of selenium, namely, that this element's electric conductivity is increased in the presence of light. With the new device the beans are carried by a conveyor under a selenium cell. As the light-hued beans reflect more light against the cell than the others, additional current is transmitted through it, which actuates a deflecting needle. This in turn operates a device that diverts the light-colored beans into a separate channel. If the speed of the machine and its first cost make it more economical than hand sorting, it is quite probable that the same principle will be used in sorting grains, tobacco, and many other products in which color is a distinguishing mark of quality.

FIRE HOSE USED AS GAS MAIN AFTER A FLOOD

About 25,000 people living in southern California, in Santa Ana and vicinity, were supplied for several days recently with natural gas received through an ordinary fire hose. The washing away of a 100-ft. section of the bridge over the Santa Ana River, which carried the gas main, cut off the supply of natural gas from a large area. But within 24 hours the employes of the gas company and the telephone company had stretched a cable across the gap and from this they suspended a fire hose which was



Fire Hose being Used to Bring Gas across a River After the Floods had Carried Away Part of the Bridge and Gas Main

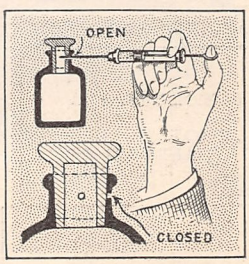
connected with the gas mains at either end. In this way service to gas users was reëstablished.

OIL-WELL BOMB EXPLODES HIGH IN AIR

A strange explosion which shattered windows in buildings within a radius of many miles occurred recently near Tulsa, Okla., while workmen were attempting to blow an oil well. Blowing an oil well consists in dropping into a newly drilled well a dynamite charge to which is attached a fuse so timed that it will explode the bomb at the bottom of the well. The explosion breaks away the last barrier of sand and permits the oil to gush forth. In this instance the oil gushed forth without artificial aid an instant after the bomb had been dropped. The up-rushing oil hurled the dynamite and its burning fuse more than 100 ft. higher than the derrick, at which point the explosion took place.

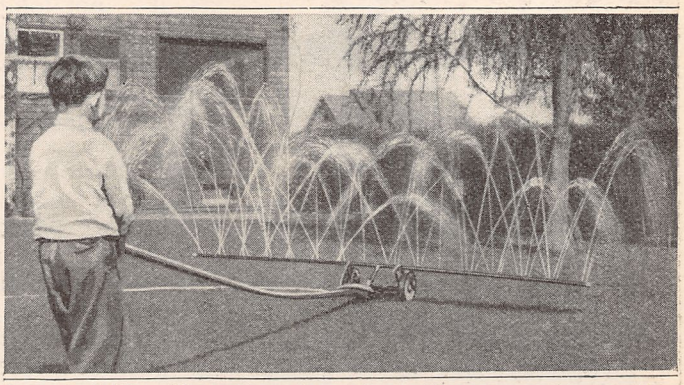
BOTTLE PROTECTS CONTENTS FROM AIR DURING TRANSFER

A bottle recently devised for the use of physicians and chemists has a stopper intended to protect liquids from the air during removal to another container. The stopper is hollow and has a perforation in one side which may be lined up with a similar perforation in the neck of the bottle. Through this opening the tip of a syringe may be inserted and any amount of liquid drawn off without exposing any of it to excessive air. Laying the bottle on its side aids this process. Twisting the stopper part way round brings the holes out of line and closes the bottle until again needed.



SPRINKLER EASILY MOVED WHILE IN USE

An ingenious professor in a western university has combined a lawn sprinkler with a dismantled lawn mower in such a way that one can move the sprinkler about the lawn while it is running, without getting wet. The long crossbar of the sprinkler was clamped to the bottom of the mower after the blades had been removed. In place of the ordinary handle a long pole was attached to the transformed mower, which reached well outside the range of the running water. This permits one to move the device about the lawn without the inconvenience of turning off the water.

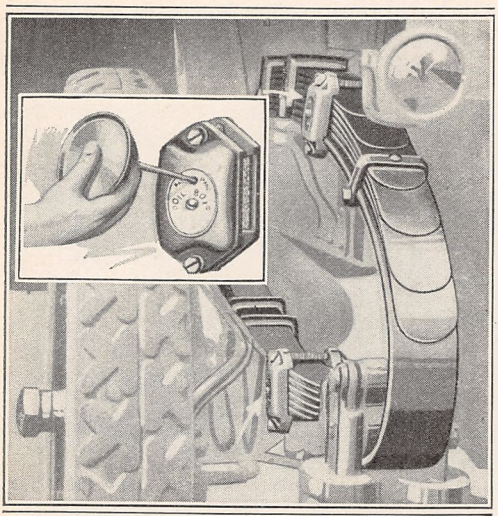


Lawn Sprinkler with an Extra-Long Handle Which can be Moved About While Water is Running

MOTOR SPRINGS LUBRICATED BY SIMPLE DEVICE

For keeping the spring leaves of a motor car continually oiled, so that they work properly and do not rust or squeak, a very simple and effective appliance has been invented. It consists of a box formed by two grooved castings, each of which holds a felt pad saturated with oil. These members are bolted to a spring so that the pads are pressed against its edges and the lubricant drawn between the leaves by capillary attraction. Oil passes from a small reservoir into the pads and keeps them soaked. These may be filled weekly with the aid of an ordinary oil-can. When springs are properly oiled

in this way there is practically no danger of water working into the pockets between the leaves and causing corro-

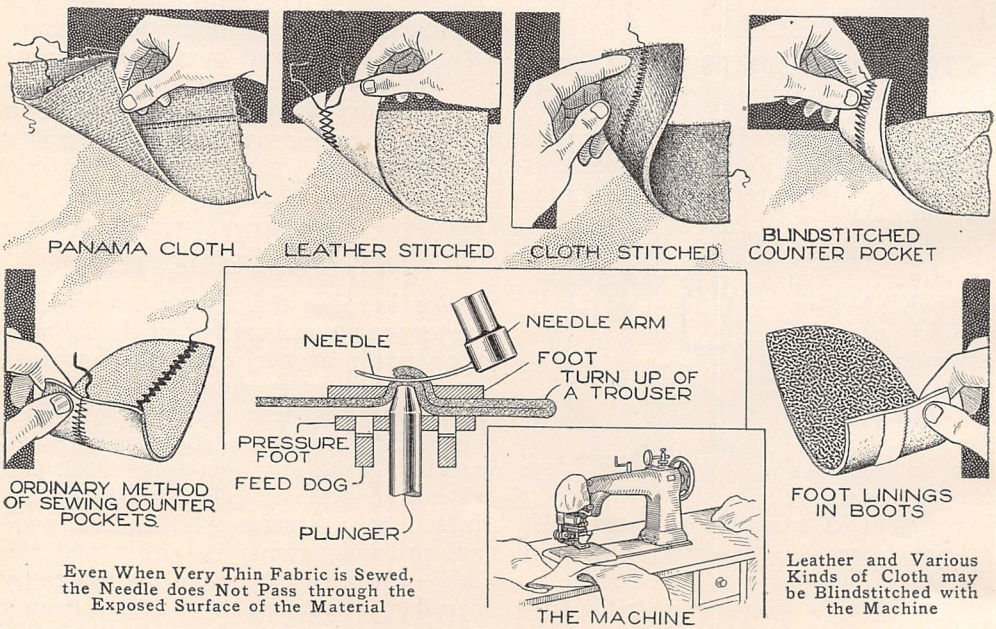


This Indicates How the Boxes are Applied and Where They are Placed on a Three-Quarter Elliptic Spring

sion. Two units are supposed to be applied to each half-elliptic spring. The time-consuming and troublesome process of periodically separating the leaves, removing rust, and inserting oil and graphite, is thus eliminated. The oilers are easily applied.

BLINDSTITCHING IS DONE BY SIMPLE MACHINE

Blindstitching of both leather and fabrics of various thicknesses is now accomplished mechanically, although it is not long since all of this kind of work had to be done by the tedious hand process. When such sewing is done, the thread does not pass through the exposed surface of the material. The edges of two pieces of leather, or of fabric which will not fray, are thus joined together without the stitches being exposed on the face of the work. On the other hand, a hem may be turned on a skirt made of a light grade of Panama, and sewed without the thread showing through. The counter pockets of heavy work shoes are frequently made of four pieces of material. The edges of these are set together and blindstitched, making a perfect seam. When such work was done by sewing through the leather, the continual rubbing against the seams wore out the thread and often caused the pockets to collapse. The machine which does this character of sewing uses a curved needle. This is held in an arm which moves back and forth,



Even When Very Thin Fabric is Sewed, the Needle does Not Pass through the Exposed Surface of the Material

Leather and Various Kinds of Cloth may be Blindstitched with the Machine

What Remained of the Ill-Fated Schooner "Aberdeen" after Its Futile Attempt to Ride Out the Storm

instead of up and down, and the sewing is done on the reverse side of the goods. When a hem is stitched, the thread is passed entirely through the upper layer and only part way through the next. If the edges of two pieces of material are held together, however, the needle does not go all the way through either of them. The machine may be adjusted to the thousandth part of an inch, enabling it to be used on quite thin cloth.

PHOTOGRAPHS PERSONS WHO LOOK AT SHOE DISPLAY

An unusual advertising scheme which was employed by a shoe dealer in Atlantic City, N. J., consisted in secretly taking a photograph of some one person each week, chosen from among those who stopped to look at the shoes displayed in the store window. The camera was concealed at the rear of the store window and no one looking in ever knew when a snapshot was taken. Each week the picture was published and the person photographed was entitled to a pair of $5 shoes free.

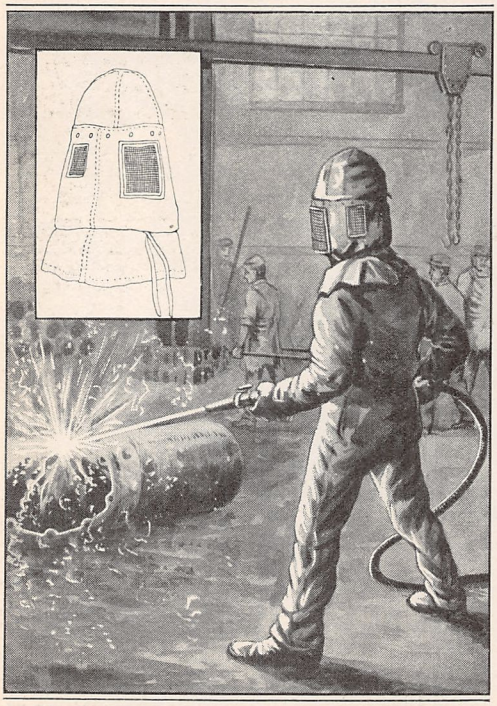
SCHOONER WRECKED IN GALE ON SAN FRANCISCO BEACH

During one of the most severe storms that have visited San Francisco in a number of years, the schooner "Aberdeen" was recently wrecked and its crew of nine men lost. The ship was caught by a 95-mile gale which had it entirely at its mercy. It was utterly impossible for the craft to ride out the storm, and during the most terrific part it was thrown onto the beach south of the Cliff House and literally smashed into kindling wood by the breakers. Broken timbers and other debris were piled high on the sands, and but little remained of the ship after the storm subsided.

MASK FOR SAND BLASTERS WORN WITH RESPIRATOR

To protect sand blasters in foundries from the deleterious effects incident to the inhalation of fine, sharp particles of foreign matter, a mask is made which is intended to cover the worker's head and be worn in addition to a respirator. This is constructed of durable fabric

and fitted with four large multiple-screened openings which permit a free circulation of air but prevent the passage of sand particles. An adjustable



By Wearing the Mask over the Head a Sand Blaster Escapes Much of the Danger of His Work

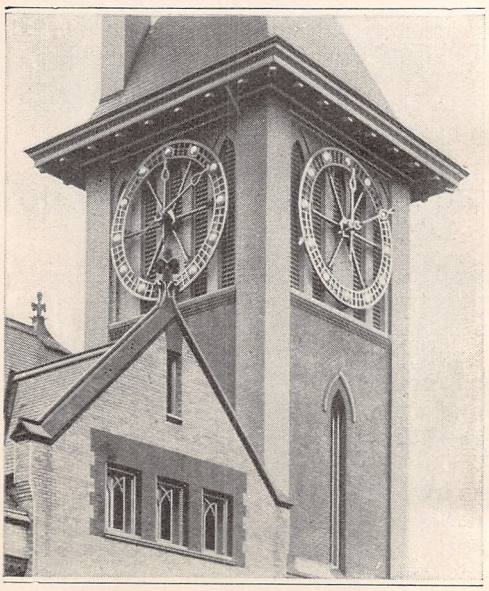
frame fits the crown of the head and holds the mask away from the face of the wearer, while at the bottom the device is tied about the neck. The largest of the screened spaces covers the front of the helmet, affording a normal angle of vision. The others appear at the ears and at the back of the head. Besides safeguarding the wearer, the mask permits him to work with greater ease and freedom than is possible with a respirator alone.

WAR CAUSES SCARCITY OF PRINTED MUSIC

The war has occasioned a rather serious shortage in copies of many musical works because heretofore Germany has controlled much of the market; furthermore she has the master plates of many famous productions, and it is difficult to reproduce these, both because of the cost entailed and the skilled processes employed. English firms are profiting by their chance to increase their business, branches of certain German houses in Great Britain have been taken over, and for the present their profits are appropriated by the government. But these channels are unable to supply the market fully.

TOWER CLOCK HAS DIALS THAT ARE REVOLVABLE

A feature of the post office and customhouse at Newbern, N. C., is a clock with a revolvable dial on each of the four sides of the building's tower. Instead of numerals, each face is studded with opalescent globes which are electrically lighted at night. The dials are of openwork pattern somewhat resembling large wheels. One window behind each is used in replacing the light globes. That this may be done easily the dial is revolved until the defective light is within reach. Near the tips of the aluminum hands are red electric bulbs which aid in showing the hour at night. The machinery of the clock is especially designed to carry the additional weight of the globes and wiring.



These Dials are Revolvable so That the Electric Globes Which Mark the Hours Instead of Numerals can be Replaced Easily

Either Firing a Revolver or the Impact of a Racer will Operate This Automatic Timer

AUTOMATIC TIMER OF RACE-COURSE EVENTS

Races of many kinds are started with the firing of a revolver. When, however, one of the timekeepers has to wait until he hears the gun report before starting his stop watch, an element of error is introduced, due to the slowness of human movements. With the obvious intention of eliminating such an error, a mechanism has been patented which is intended to work a stop watch automatically. Firing off the gun makes the exploded gases hit a paddlelike lever mounted on the end of the gun, causing a switch to be closed. This in turn works an electromagnet which starts the stop watch by pulling down on a lever. Another switch, consisting of a long arm projecting out over the speedway, is provided, which also may actuate the stop watch through the electromagnet. This second switch may take the place of the revolver, and is operated by the impact of a passing racer. Firing the revolver starts the stop watch and the impact of the racer stops it at the last lap of the race.

TWENTY CENTURIES COVERED IN NEW CALENDAR

Simplicity of arrangement is one of the outstanding features of a 2,000-year calendar which has lately been devised by a New Jersey man. Its span reaches from the year 100 to 2,100, offering a ready means of determining on what day of the week any date within this period fell, or will fall. The Gregorian rule of intercalation is followed throughout. The calendar consists of a chart, printed in pocket size, containing five column divisions under the headings of months, days, key, centuries, years. Underlined numbers in the years column represent leap years, while in the months column dashes following January and February mean that the numbers appearing with those

respective months should be used only in making leap-year calculations. Elsewhere in the column the two months

MONTHS	DAYS	KEY	CENT	YEARS
MAY 1	1-8-15 22-29 1	THU—4 FRI—5 SAT—6 SUN—7	20—16 12—5 1	05-11-16-22 33-39-44-50 61-67-72-78 89-95 4
FEB— AUG 2	2-9-16 23-30 2	MON—8 TUE—9 WED 10 THU 11	19-11-4 2	04-10-21-27 32-38-49-55 60-66-77-83 88-94 3
FEB MAR NOV 3	3-10-17 24-31 3	FRI 12 SAT 13 SUN 14	10-3 3	09-15-20-26 37-43-48-54 65-71-76-82 93-99 2
JUN 4	4-11-18 25 4	MON 15 TUE 16 WED 17 THU 18 FRI 19	18-9-2 4	03-08-14-25 31-36-42-53 59-64-70-81 87-92-98 1
SEP DEC 5	5-12-19 26 5	SAT 20 SUN 21 MON 22 TUE 23	15-8-1 5	02-13-19-24 30-41-47-52 58-69-75-80 86-97 7
JAN— APR JLY 6	6-13-20 27 6	WED 24 THU 25 FRI 26 SAT 27	17-14-7 6	01-07-12-18 29-35-40-46 57-63-68-74 85-91-96 6
JAN OCT 7	7-14-21 28 7	SUN 28	13-6 7	00-06-17-23 28-34-45-51 56-62-73-79 84--90 5

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By Making a Simple Calculation, This Calendar Shows on What Day of the Week Any Date, Since the Year 100, Fell

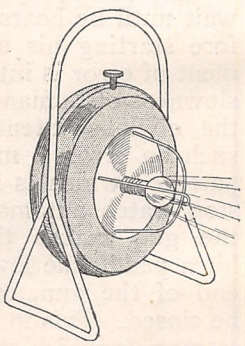
again appear with other numbers which are intended to be used ordinarily. To illustrate the manner in which the calendar is employed, Sept. 14, 1890, may be taken as a test date. In the months column September is designated by the figure 5 in a triangle at the lower right-hand corner of the square. In the days column the fourteenth is similarly designated by the figure 7. In the century column the unit number for 18 is 4, and likewise in the years column 5 appears with 90. Adding these figures, 5, 7, 4, and 5, the sum 21 is reached. Sunday appears opposite this number in the key column. Therefore Sept. 14, 1890, fell on Sunday. If Feb. 2, 1932, were taken, it should be remembered that this will be a leap year, and that in making the calculation the number accompanying the "February" which is followed by a dash should be used. The computations are simple and may be made in a moment's time.

SHORTAGE MAKES FARMERS CONSERVE SEED CORN

The prospect of the most serious shortage of seed corn that this country has experienced in years has resulted in an extensive campaign for the conservation of seed corn, particularly in what is known as the Corn Belt. Special emphasis has been laid on properly storing seed corn and testing it so that only good seed will be planted this spring. Bankers, school-teachers, and preachers have shared in the agitation. Many farmers had planned to use 1914 corn for seed, but the war has made it scarce. In any event, such corn should be tested, say agricultural experts. The cold, rainy summer of 1915 produced much corn that was immature, had an excessive amount of moisture, or was otherwise unfit for seed. By properly hanging the selected ears in a dry place, and by germinating a few kernels from each ear, farmers have been able to select only such seed as will give a profitable yield.

ELECTRIC LANTERN SHAPED LIKE A WATCH

A convenient electric lantern, just placed on the market, is shaped somewhat like an unusually large watch and is provided not only with a bail but with an easel-like support by which it is held in upright position when set on a flat surface. The lantern can be adjusted so that it either produces a general illumination or throws a small searchlight beam a hundred feet ahead. Current is supplied by a standard flash-light battery that can be obtained at any electrical store and is easily removed and replaced. The light is switched on and off by a thumbscrew at the top of the case.



NEW METHOD OF TINNING WIRE SAVES METAL

A system of tinning wire which effects a considerable saving by preventing oxidation of the melted metal has been introduced in England. The melting pot of the furnace is surmounted by a dome-shaped casting through which pass the waste gases from the Bunsen burners that heat the pot. Because of this oxygen-free atmosphere there is an absence of oxidation of the melted metal, which results in a saving of $1 per ton, it is estimated. The metal is maintained at the proper fluidity by a thermostat which governs the flow of gas. The gas is fed from the municipal mains at low pressure without the use of fans, blowers, or compressors. The wire is run through the melting chamber and into the melting pot, a method of spring control preventing the breaking of the strands. A fixed wiper, which acts on the wire as it leaves the melting pot, causes the drips to fall back into the melted mass.

REGULAR AND VESTIBULE TELEPHONES COMBINED

Since telephones instead of speaking tubes are now generally used in large apartment houses between the entrance vestibule and each apartment, an adaptation of a telephone system used in some offices has been designed, which dispenses with an operator in the vestibule and likewise makes two telephones in each apartment unnecessary. A telephone instrument is installed in the vestibule and connected with a common-battery substation telephone in each suite. Connected with the vestibule instrument is a set of buttons, or other means of ringing an ordinary vibrating bell in any apartment with which communication is desired. The tenant answers by throwing a cam switch key into a certain position. If a call comes from the city exchange, it rings the regular telephone bell, and communication is established by throwing the key into another position.

CALIFORNIA TRAMP COOKS MEALS ELECTRICALLY

Out of Marysville, Cal., comes a story of a hobo who prepares his food on an electric hot plate instead of

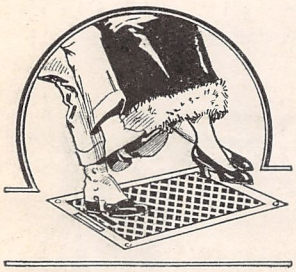
Hobo Prepares Meals on Hot Plate by Tapping Current of Electric Interurban Lines

cooking it over an open fire kindled with brushwood picked up from the wayside. He camps along the right of ways of electric-traction lines and thus always has an abundant supply of current at his command. He carries a small folding gridiron, on the under side of which is a series of resistance coils. When mealtime comes he places the device on a couple of bottles or a stone, grounds it by making contact with a rail, and then throws an insulated wire, fitted at one end with a

hook, to an overhead transmission line, or fixes it to a third rail. It is not a trick to be attempted without great care, however, for a dangerous shock is as likely as not to result.

SIMPLE MOTOR-CAR HEATER AND VENTILATOR

A motor-car heater and ventilator which utilizes surplus heat from the engine by the aid of a forced-draft system is now manufactured for practically all types of gasoline cars. A small register is set in the floor in front of the front seat and is connected with a sleeve which is placed over the exhaust pipe in such a position that the draft from the fan and the air current caused by the forward movement of the car will strike it. There is no contact with exhaust gases. By tacking a piece of cloth, about 9 inches square, to the under side of the front floor board a cold draft from the pedal holes is deflected, and by using a piece of rubber matting with a slit in it the opening about the side lever is practically closed.

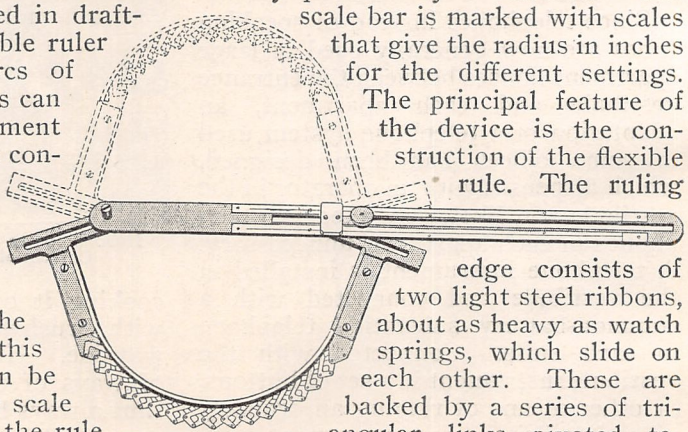


SCHOOLS' BILLIARD TABLES MAY CHECK POOL-ROOM EVIL

An experimental effort to counteract the lure and the vicious influence of the pool rooms of Chicago with billiard tables placed in wholesome surroundings is being made in that city by installing a pool table in each of two public schools. The tables are placed in the game rooms and are used on the evenings when the building is open as a social center.

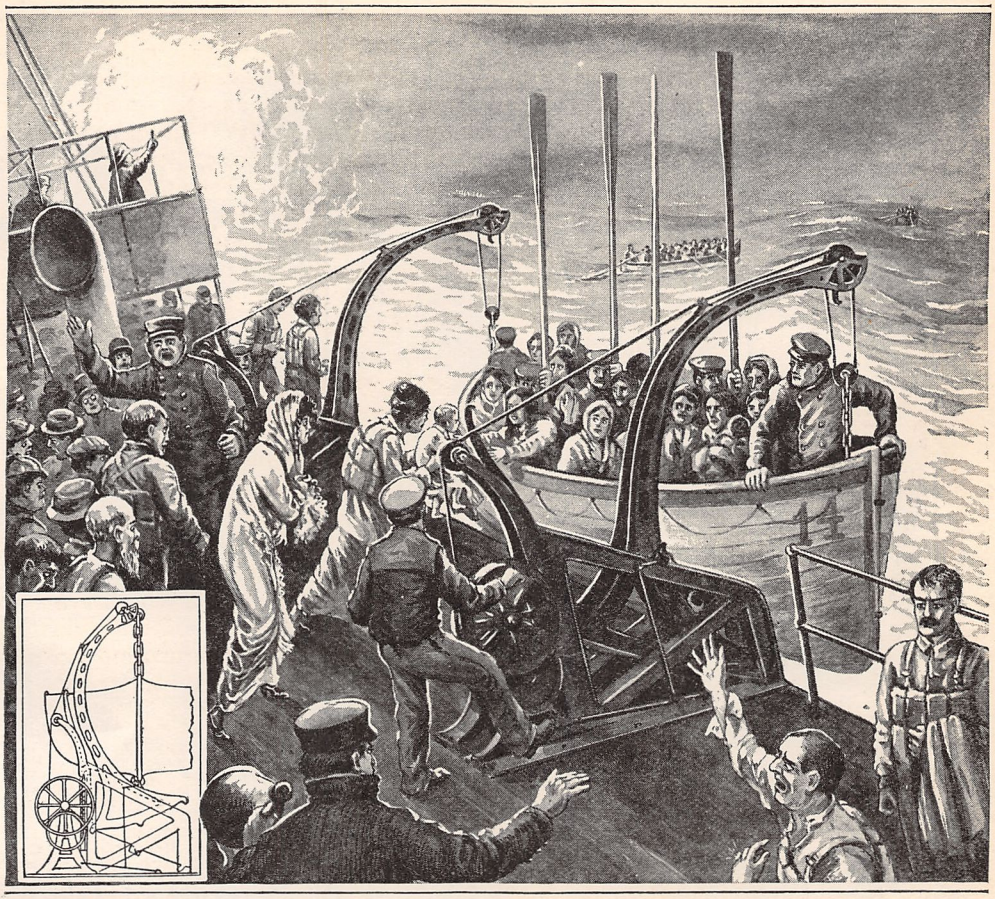
INSTRUMENT FOR DRAWING CIRCULAR CURVES

A new drafting instrument that is intended to replace the set of curve templates commonly used in drafting offices, is an adjustable ruler with which circular arcs of from 3½ to 100-in. radius can be drawn. This instrument can be used with either a concave or a convex ruling edge. The flexible rule is mounted on end plates which are provided with slots that engage pins carried on the rigid scale bar, and with this arrangement the rule can be slid from one side of the scale bar to the other. When the rule is on one side of the scale bar the ruling edge is convex, and when on the other side the ruling edge is concave.



This Rule can be Set for Any Circular Arc from 3½ to 100-Inch Radius. Full Lines Show Rule Set for Concave Curve; Dotted Lines, Convex

One of the pins is fixed to the end of the scale bar, while the other slides in a slot which runs longitudinally of the bar and can be fixed in any position by a setscrew. The scale bar is marked with scales that give the radius in inches for the different settings. The principal feature of the device is the construction of the flexible rule. The ruling edge consists of two light steel ribbons, about as heavy as watch springs, which slide on each other. These are backed by a series of triangular links pivoted together and so connected with the ribbons that the same degree of curvature is maintained over all of the ruling edge. The flexible part connects at each end with a straight section that forms a tangent to the curve.



Automatic Davit Lowers Boatload in Less than One Minute's Time through Aid of Quadrant Arms Supported upon Rocker Base

AUTOMATIC DAVIT LAUNCHES LIFEBOATS QUICKLY

Since the "Titanic" went down, law-making bodies have been prolific in mandates setting forth what shall be done to increase safety of life at sea. Strongest emphasis is placed on a sufficient number of lifeboats and a proper method for their launching. An automatic davit, recently invented, seeks to satisfy the latter requirements in some degree. Consisting of two steel quadrant arms supported by suitable standards at each end of a lifeboat, the contrivance differs materially from the sort of davits and tackle ordinarily used.

At the moment when passengers are piling into one of the boats the standards are in vertical position and the boat's keel is held steady with a special claw which grips it securely until released by a hand lever. A hook, caught on the gunwale, also aids in the steadying process. Pushing the forward lever releases the whole apparatus and the quadrant arms slide slowly down an inclined plane until, projecting far out over the ship's side, they are in position to lower the boatload safely. One of the men in the boat holds a rope tied to a brake arm on the hoisting mechanism above. With this he is enabled to control the speed of descent. The whole operation of releasing and lowering the boat may be performed in less than one minute if necessary. There is little danger of the ropes jamming and causing trouble.

SOME NOVEL AND LITTLE-KNOWN ACCESSORIES

False Top, Made of Tongued and Grooved Sections, Converts Any Table into a Commodious Round One When Guests are to be Entertained at Dinner

Hairpin of New Type Available in Various Sizes and Colors, Designed with Gripping Member Which is Intended to Hold It Securely in Place

Within a Half Hour after Ingredients are Placed in This Vacuum Freezer, Ice Cream Is Ready to Serve. It Is Especially Convenient for Motorists

Neat-Appearing and Convenient Holder for Toothbrush, Having Antiseptic Vaporizer Which Sterilizes the Bristles and Keeps Them Sweet and Germless without Special Attention on User's Part

This Scoop Has a Weighing Mechanism and Indicating Dial Embodied in Its Handle. While Intended for Stores, It might Also be Employed Advantageously in Large Kitchens

Motor Attachment Illustrated at the Right Enables Any Phonograph to be Operated Electrically: The Device is Not Permanently Mounted, but Merely Set so That Its Propulsion Wheel Is in Contact with the Rim of the Turntable

Cover Plate and Bail for Milk Bottle, Enabling the Latter to be Carried Easily and Its Contents Protected. Device is Unfastened by Raising Cap

DEVELOPED FOR THE HOME AND ITS MEMBERS

The Spiral of Noncorrosive Metal in the Cellar is Revolved by Turning the Knob at the Top. This Breaks Up the Salt and Allows It to Flow Freely Even When Damp

Hydrometer Designed as a Household Instrument for Testing the Quality of Milk: Instead of being Graduated in the Usual Way, the Tube is Divided into Three Colored Sections

This Manicure Set, Which Fits in a Large Buffer, Is Available in Different Qualities. Its Compactness Makes It a Convenient Accessory for the Traveler's Toilet Case

In Addition to Having an Adjustable Handle, This Parasol is Designed so That It may be Folded and Slipped into a Small, Attractive Case. It is Suited for Beach, Canoe, or Open Car

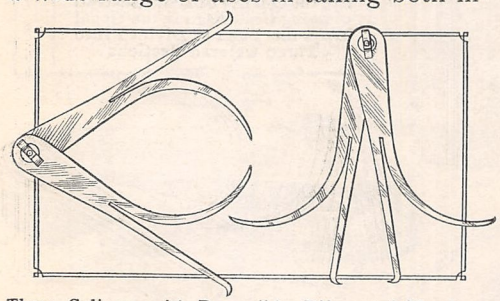
The Refrigerator Shown at Right is Provided with an Attachment Which Permits Water from the Melting Ice to be Drained into a Kitchen Sink

When Packed in a Trunk or Suitcase, Men's Trousers may be Kept in a Presentable Condition if Held in a Pressing Form Such as is Shown Here. The Device is Made of Fiber and Weighs 20 Ounces

Correct Gloves for Golf Players: The Right One is Made Entirely of Chamois, While the Palm and Inside of Fingers of Left Are of Tan Capeskin. Both Have Open Knuckles and Button on the Outside of the Wrist

INSTRUMENT COMBINES TWO TYPES OF CALIPERS

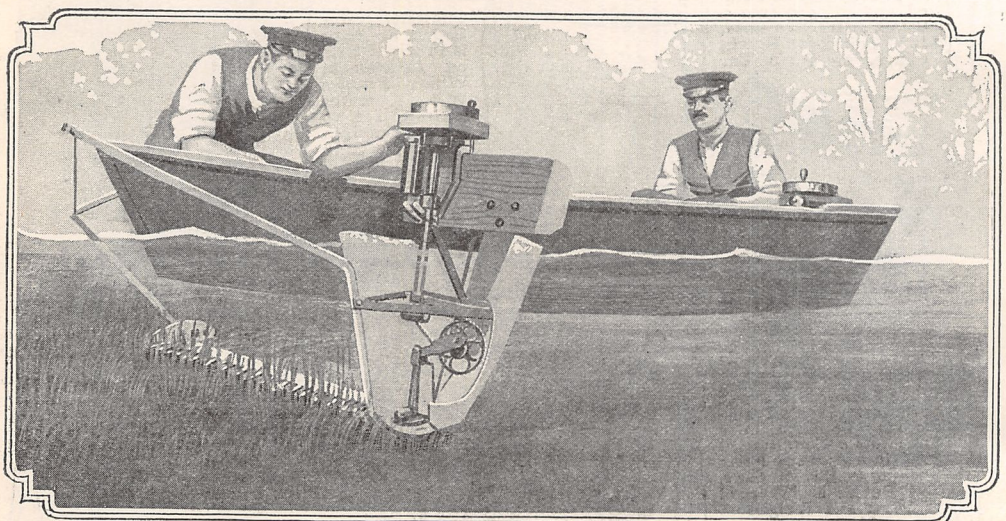
Calipers with bifurcated members of a design which makes them adapted to a wide range of uses in taking both inside and outside measurements, have been patented. This instrument consists of a pair of members pivoted at their upper ends and so constructed that they allow a reversal of their positions by rotation about the pivot, to which is attached an ordinary thumbscrew for setting them in any position. Of the two limbs resulting from the bifurcation of each member, one is straight except at the tip, which curves outward, and the other is curved, being of quadrant formation. The curved limbs of the two members normally project inward. By drawing the two straight legs into almost parallel positions, with the curved tips extending outward, the instrument can be used to measure exceedingly narrow spaces. Another of the many uses of these calipers is ascertaining outside distances at the far side of an intervening pipe or other obstacle. This is accomplished by extending the curved legs around the obstruction, to the object to be measured.



These Calipers with Reversible, Bifurcated Members can be Used in Measuring Articles of a Great Variety of Shapes

MARINE MOWING MACHINE FOR SUBMERGED WEEDS

To clear off water lilies, reeds, and the assorted weeds which habitually overrun shallow lakes, an Ohio experimenter has recently brought out a marine mower, operated by a gasoline engine and moved from place to place by boat. The sickle on the contrivance much resembles that on the ordinary farm mower, and is suspended beneath the boat by means of suitable rods. A gasoline engine of the type used for driving rowboats furnishes power for the sickle through the aid of a connecting shaft running down into the water. Another and similar engine drives a propeller at the rear end of the boat, and forces the whole affair against the weed beds at any rate desired by the operator.



Sickle Set Up beneath Rowboat Mows Under-Water Weeds of Shallow Lakes. A Gasoline Engine Drives the Sickle and a Second Engine Propels the Boat into the Weed Beds

DRILLING WELLS BY HAND THROUGH LIMESTONE

Quite a simple and inexpensive plan of driving a well in limestone formations is commonly followed in Dade County, Florida, on a strip of high ground extending between the Everglades and the ocean. The material, which is very porous and soft, is covered by only a few inches of soil. It offers little resistance and is easily penetrated with almost any tool. This has led to the practice of cutting a series of teeth in one end of a coupling, screwing a length of pipe into the other end, and using the implement thus formed in place of a drill. Two men, standing opposite each other, grip the pipe and strike into the limestone with it. The teeth provided in the coupling quickly chip into the soft rock and in a very short time a good start can be made. A small amount of water is poured into the hole at intervals to facilitate the work. With each stroke the pipe is turned slightly. Usually surface water is struck at about 15 ft., and unless quicksand is encountered, a pipe can be driven that distance in a couple of hours. When water is wanted for drinking purposes, however, a bore is commonly carried to a greater depth. At times a pipe is driven down 50 or 60 ft. by this hand method, and since labor is cheap, a very small expense is incurred. At the lower depths salt water is often reached, making it necessary to draw back. When a pipe has once been put down, the bore forms a casing for it and permits it to be withdrawn and its screen cleaned or repaired at any time conditions may demand. The natural trend of the water in the Everglades at this point is to flow through the porous formation to the sea. Because of this, it is not unusual to find a fresh-water spring in close proximity to salt water.

¶To protect army surgeons in active service from being accidentally fired on, it has been proposed that the surgeons of all nations wear similar uniforms of some vivid color.

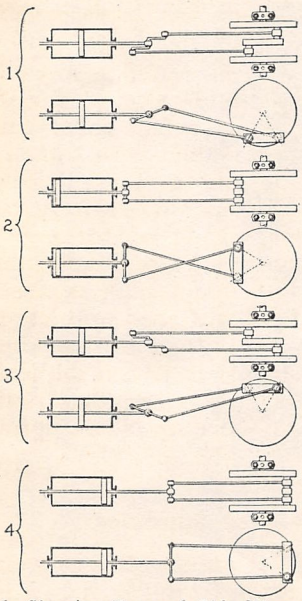
SUBSTITUTE FOR BUTTONS AND LACINGS

A hookless and buttonless fastener which takes the place of laces, shoe buttons, etc., is being manufactured. To the edges of two pieces of material to be fastened together are clamped rows of small metal loops which project slightly beyond the material. They are set far enough apart so that the ends of the loops on one piece of material may be fitted between the ends of the other series of loops. One side of each loop end is concave and the other is convex, so that when the two series are fitted together they interlock firmly. To separate the projecting ends slightly, in order that the two series may engage each other, the two edges are fed through a Y-shaped metal guide entering at the top of the "Y," as shown. The edges emerge from the lower end of the "Y," firmly interlocked. To fasten or unfasten the two edges it is only necessary to move the guide up or down.

A Shoe Fastener Which Dispenses with Buttons and Laces. Insert Shows How the Tiny Metal Members may be Made to Interlock Simply by Pulling the Tongue in the Center

DOUBLE CONNECTING ROD REDUCES PISTON SPEED

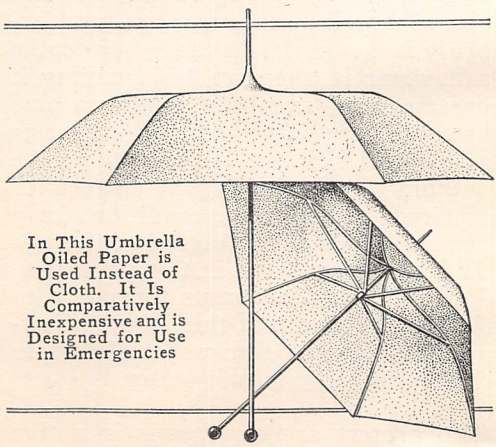
A double connecting rod recently brought out by a European inventor affords an interesting study in mechanical movements. Designed to reduce piston speed as well as centrifugal force in some parts of the engine, the new rod differs materially in its working from ordinary kinds. At the end of the piston rod a cross-head is mounted in the usual manner. But this, instead of having an ordinary pin for the attachment of the connecting rod, carries a double-armed, center-pivoted lever which much resembles the pedal crank on a bicycle. To the outer ends of this crank two long spindling rods are attached, these running to two individual cranks a small angular distance apart on the main, or flywheel, shaft of the engine. Hence the force supplied by the piston is carried to the flywheel through this double connecting rod, instead of a single, as in the ordinary engine. The advantages claimed for this arrangement are several. Due to the fact that the connecting rods are attached to a double-ended lever at one end, and to two pins on the same side of the driven axle at the other, they are at times crossed and at other times parallel during a revolution, as is shown by the drawing. This has the effect of lengthening and shortening the distance between piston rod and crank. As a result, the piston speed at both ends of the cylinder is less than it otherwise would be. In consequence it is maintained that this arrangement allows for high flywheel speed with as little vibration due to reciprocating parts, as other engines with an ordinary connecting rod attain at a lower speed. Furthermore, in the case of a gas engine, the low piston speed at each end of the cylinder makes admission, combustion, and exhaust easier to accomplish. This is an attainment often desired in combustion engines running at high speeds.



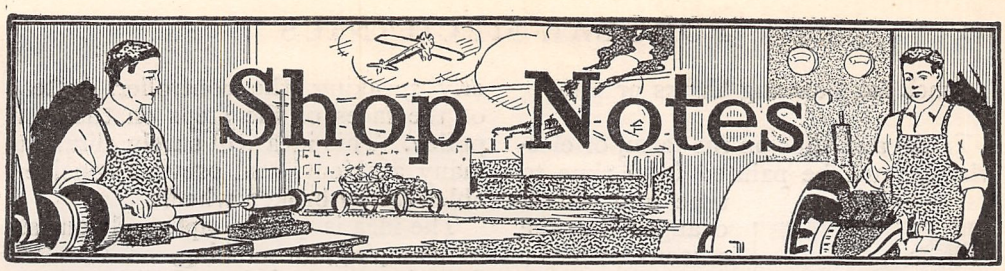
1—Showing Top and Side View of Piston and Connecting Rods in the Middle of a Stroke
2—Here the Piston has Reached the End of Its Stroke and the Connecting Rods are Crossed, Reducing Their Effective Length. During the Crossing Process the Piston Slows Up
3—This Is the Same as the First Position Except That the Crank Is Now in the Upper Half of Its Stroke
4—Here the Straightening Out of the Connecting Rods from an Angular to a Parallel Position Results in Reduced Piston Speed at This End of the Stroke

PAPER UMBRELLA FOR EMERGENCIES

A paper umbrella, for use in emergencies, which its makers claim is rain and wind-proof has recently been put on the market. It is designed to be sold at news stands, elevated-railroad stations, restaurants, cigar stores, etc. The article consists of a metal frame of special design to give it unusual flexibility, a wooden handle, and oiled-paper covering. It is light and folds compactly, while with ordinary care it can be used several times.



In This Umbrella Oiled Paper is Used Instead of Cloth. It Is Comparatively Inexpensive and is Designed for Use in Emergencies



Locating and Repairing Small Leaks in Automobile Radiators

A slight leak in a radiator is very often hard to locate and in some cases almost impossible. Such a leak may be found quite readily by removing the radiator and, after plugging all the openings except one, running the end of a tire pump through a cork of suitable size and placing this cork in the remaining opening. Put the radiator in a tub or tank of water and pump air into it, and bubbles will issue from the points of leakage. These points should all be carefully marked before the radiator is removed from the water. The surface of the metal around the hole should be thoroughly cleaned and then soldered. It is always best to test the radiator after making the repairs, as very often the opening is not completely closed.

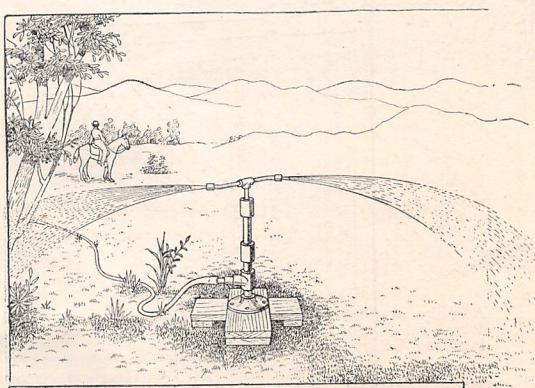
In some cases small leaks may be closed by using ordinary bran mixed with water and placed in the radiator instead of clear water, but such a practice is not recommended, as it tends to produce a poor circulation, and the engine will heat.

Small leaks may be sealed as a result of cleaning out the circulating system with a strong alkali, such as soda. The soda coming into contact with some of the metals forms an insoluble filling and may close the opening entirely.

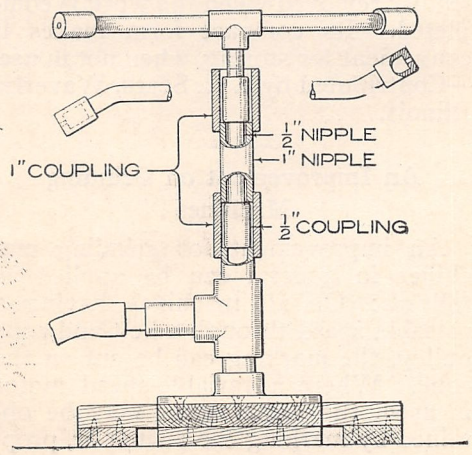
A convenient means of making a temporary repair in a leaky honeycomb radiator is to take two small washers with sheet-rubber surfaces and place them on opposite ends of the opening through the radiator in which the leak occurs, and draw them together with a piece of small wire, or short spiral spring.

Large-Area Sprinkler

Pipe fittings of standard sizes were used in making the sprinkler shown in the illustration. The area watered varies from 100 to 120 ft. in diameter, according to the water pressure. The device may be made easily by buying the fittings and joining them, as shown, with white lead rubbed into the joints. A farmer at Quilcene, Wash., used several of them with great success during a dry spell.—Contributed by F. B. Willoughby, Katalla, Alaska.

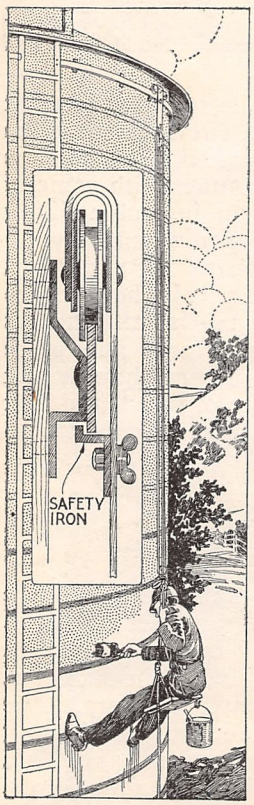


This Homemade Sprinkler Sprays an Area 100 Feet Across



Track for Painting Tanks or Silos

Tanks and silos on the farm, or elsewhere, must be painted from time to time and with changes in the seasons their bands should be adjusted. This work is troublesome because a ladder must be moved frequently in order to do the work. The device shown in the sketch obviates this and is of simple construction. If it is made properly with a safety iron, as shown, there should be no danger.



The workman is suspended in a sling seat and raises and lowers himself by means of blocks and tackle. The rigging is suspended from a double-roller hanger which rides on a track made of band iron. The hanger and the rigging may be readily put into place and as readily removed when the work is completed. Its compact form makes it convenient for storing, when not in use. —Contributed by I. L. Sears, Waverly, Illinois.

An Improvement on Grinding Machines

An improvement for grinding machines in general can be applied as follows: On all machines having a variable speed through a belt and cone pulley, the marking can be cut on the cone. Where a variable-speed motor is used, the same result may be obtained by marking the switch or, properly speaking, the controller, instead of the faces of the steps on the cone pulley. This idea will surely eliminate many accidents and prevent considerable loss by broken wheels.

The idea is quite simple and consists in stamping, or etching, on the face first the speed of the grinding spindle when the belt is on that particular step of the cone, in revolutions per minute; the largest size wheel it is safe to use at this speed, a safe average being taken for cup wheels, dish wheels, straight-face wheels, etc.; and to this may be added, if desired. the surface speed of the maximum-size wheel in feet per minute.

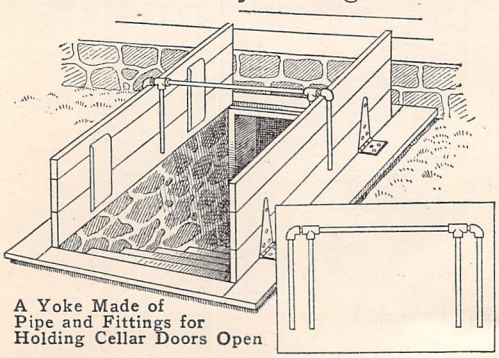
All the information needed may be readily obtained from the catalog of any manufacturer of abrasive wheels. Many well-known firms will sanction this idea as being of practical value.

Thinner Oils Used on Automobiles in Winter

As cold weather tends to thicken oils, it is quite necessary to remove this oil from the gear sets on an automobile, and lubricate them with a thinner oil. In doing so, drain the heavy oil and flush out the box with kerosene, to remove any gummy deposit.

Holder for Cellar Doors

Four pipe fittings and five pieces of pipe can be fashioned into an excellent device for securely holding two cellar



A Yoke Made of Pipe and Fittings for Holding Cellar Doors Open

doors open. The holder is slipped over the doors after they are raised into a vertical position.

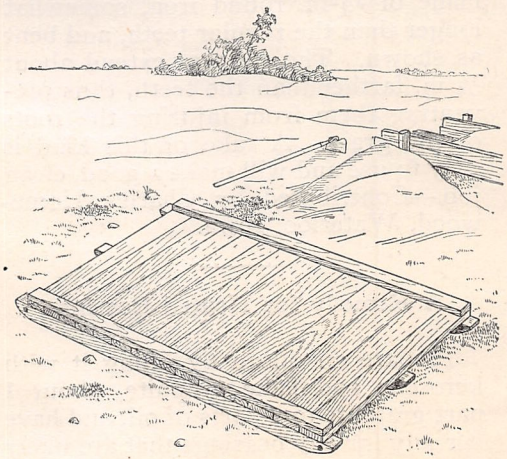
Adding Luster to Brown Iron Paint

Brown iron-oxide paint has been noted to lose its luster soon, and while this may be partly due to the possible addition of turpentine, yet the flat drying is rather a peculiarity of the paint, and it is helped by using boiled oil with it instead of the raw oil and omitting all turpentine or benzine driers.

Platform for Mixing Concrete

Concrete has become one of the best materials for building construction on the farm, as elsewhere, and knowledge as to its proper mixing is of importance. One of the requisites is a mixing platform, and that shown in the illustration may be made readily. Farmers, or others who prepare concrete from time to time, will be repaid for the making of such a platform.

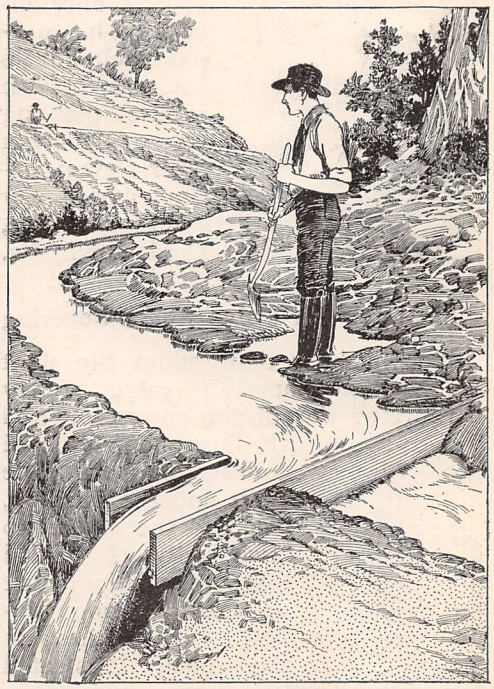
The materials necessary are three pieces, 12 ft. long and 4 in. square, for the runners; 14 planks, 7 ft. long, 10 in. wide, and 2 in. thick, and two pieces of 2 by 4-in. material, 12 ft. long. It is built on skids so that it may be hauled from place to place. The planks should be surfaced on the upper sides so as to be suited for the shoveling of concrete. Holes are bored in the rounded ends of the skids so that clevises may be attached to them.



The Concrete-Mixing Platform may be Hauled into Place Readily

Preventing Ditch Washouts

Spillways placed in irrigation and mining ditches on hilly ground prevent washouts during periods of high water.



Spillways in Irrigation and Mining Ditches on Hilly Ground Prevent Washouts

The spillways may be made of wood and should be placed as shown in the sketch, about one-fourth of a mile apart. The bottom of the trough should be grooved into the sides to make a substantial construction.—Contributed by H. W. Offins, Grants Pass, Oregon.

Keeping the Buttonhook Handy

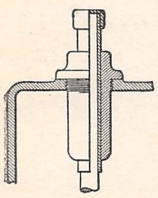
Suspending the children's shoe buttonhook on a piece of fishline above a footstool ended the daily search for the hook when the youngsters were in haste to dress for school. Each one goes to the buttonhook, knowing that it will be in place, instead of carrying it away and causing another a search. The stool was also found convenient in that it spared furniture from the marks of shoe nails.—Contributed by J. F. Long, Springfield, Mo.

A Novel Cigar Holder

A unique cigar holder can be fashioned from the claw of a lobster. It not only answers the purpose well, but its color is much more pleasing than many a meerschaum. — Contributed by James M. Kane, Doylestown, Pa.

Carburetor Air-Valve Shaft Covering

The bushing that guides the shaft on the auxiliary air valve of my carburetor was of the open type, and the dust and grit would collect between the shaft and the bushing, causing the valve to stick badly. I decided that the bushing must be closed in some manner, which resulted in the repair illustrated herewith. The hole in the bushing was redrilled to a larger size, and a piece of thin steel tubing was pressed into it, as shown. A thread was provided at the upper end of the tubing for the purpose of attaching a small cap. This cap was turned from brass-bar stock. —Contributed by Adolph Kline.



Oiling a Drill

Oil may be constantly applied to a drill point as shown in the sketch. Wrap a small piece of cotton waste around the drill at the top, and saturate it with oil. If the drill becomes heated the oil will flow more freely and keep the point well lubricated. — Contributed by Harry Quinter, Steelton, Pa.

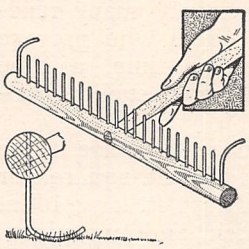
¶Emery powder may be kept handily in an old salt shaker.

Glare Dimmer for Automobile Drivers

A 6-in. disk of transparent, green celluloid, pasted to the windshield a trifle below the normal line of vision, will prevent the momentary semi-blindness which the glare of an approaching headlight inflicts on the automobile driver. By stooping slightly over the steering wheel one can look through the disk into the glare without eye strain.

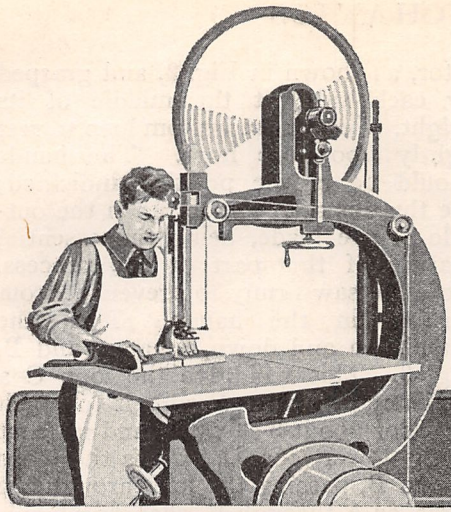
A Homemade Lawn Rake

A round piece of wood, about 18 in. long, constitutes the head for the rake teeth, and is marked for ¼-in. holes, about ½ in. apart, whereupon the holes are drilled and the teeth inserted. The latter are made of ¼-in. iron, about 4 in. long, with the projecting ends made round. The teeth must be the same length and project from the head the same distance. The end holes are used for the runners. These are also made of ¼-in. round iron, somewhat longer than the regular teeth, and bent as shown. The runners extend about ¼ in. farther than the teeth, thus preventing them from injuring the roots of the grass. A rake of this kind is easy to use and will make a good, clean job.—Contributed by Charles Homewood, Waterloo, Iowa.



A Remedy for Heated Bearings

Prepare an oilcan by filling it with kerosene and flake graphite, about 1 part graphite to 7 parts of oil, and have it ready for any bearings that are likely to become heated. Force the mixture into the heated bearing until it flows out between the bearing surface and the shaft, then follow with a small quantity of thin machine oil.



Care of the Band Saw

by Charles A. King

MAXIMUM output and a high grade of work on a band saw are possible only with the combination of a skillful workman and a well-designed machine, having a blade without kinks, brazed, set, and filed properly.

The machine should be set level and firmly, so that its vibration is reduced to a minimum; the wheels should be balanced and their rubber rims must be in good order. The edges and side of the blade should run at right angles to the table, when in its normal position, and the machine should be fitted with an efficient, adjustable saw guide. A makeshift will not permit the saw to attain its maximum efficiency, and shortens the life of the blade.

A band saw should not be permitted to stand overnight at the tension necessary for satisfactory operation, as the night temperature of a shop may cause the blade to break. This danger has been minimized in the best types of modern machines by an arrangement of springs which regulates the tension so that a serviceable saw is not in danger of breaking. It is best, however, not to keep the saw at high tension longer than necessary, and the upper wheel should be dropped a little whenever the saw is not in use, for a saw may be slightly defective and yet give no evidence to the naked eye.

In starting a band saw, test the blade with the fingers to insure that it has the proper tension, and give the upper wheel a turn or two by hand before shifting the belt. The friction of the blade on the lower, or power, wheel causes it to turn the upper wheel. The motion communicated from the upper to the lower wheel will permit the belt to be shifted more evenly, and will minimize the starting strain. It will also insure that obstructions are not in the way of the wheels.

An important condition in the efficiency of a band saw is the speed at which it is operated. If the countershaft travels at the speed recommended by the manufacturer, it will be satisfactory, but if this information is not available, the blade should be operated at a rate of 10,000 ft. a minute.

Judgment must be applied in adapting a saw to the work in hand, and frequently small blades are ruined by attempting extremely heavy cuts with them. Do not force a wide saw to cut around a curve of small radius; this should be attempted only with a narrower one. Take time to change, or sharpen, saws, rather than use one that is improperly set or sharpened. Use the largest blade which the nature of the work will permit. The larger saw resists the tension better, and there is less danger of breaking it, or of pulling it from the wheels, when necessary to back out of a cut.

A band saw will run for some time after the belt has been shifted to the loose pulley. To stop it quickly, apply

moderate pressure to the lower edge of the top wheel with a piece of wood. A thick piece of wood must not be pressed against the blade to stop the machine. The diminishing power does

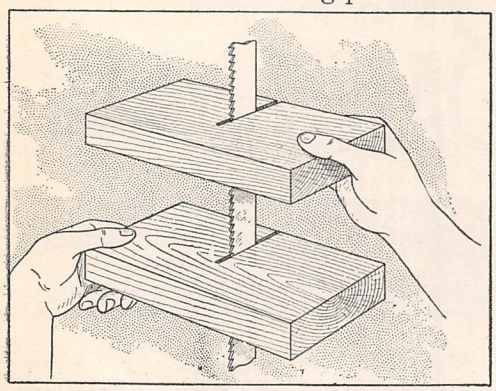


FIG. 1
Grasp the Blocks and Apply the Proper Pressure to Remove Kinks or Twists

not permit the teeth to cut properly nor to clear themselves, causing undue strain on the blade.

Straightening a kinked, bent, or twisted saw blade so that it will cut smoothly, is difficult. The defect may be remedied to a considerable extent, and sometimes apparently removed. A minute crack in the saw may result from a small bend, and in time may cause a break. After a blade has been broken while running and has suffered incidental bends and twists, it is more likely to break. To reduce a kink or twist in a saw, make a cut in one edge of each of two small pieces of wood, and holding them as indicated in Fig. 1, apply a twisting pressure as required.

Handle the blade very carefully when removing it from the machine. Do not hang it up at full length, but fold it into a circle of three turns, in which form it can be handled easily and safely. Every one who has occasion to handle a band saw should understand the method of folding the blade, illustrated in the sketches herewith, as by following it a blade may be arranged in compact form without harm to bystanders, the operator, or the saw. The method is shown in Figs. 2 to 6 and is as follows:

The saw blade should be held vertically with the teeth toward the operator, as shown in Fig. 2, and grasped by each side, at the middle of its height. Permit the bottom loop to rest lightly upon the floor. The hands should be in the position indicated; the thumbs at A and B, upon the outside of the blade, being the essential feature of this part of the process. Hold the saw firmly to prevent it from turning in the hands. Turn the thumbs in and down, as at A and B, Fig. 3. This will give the loop C a tendency to drop. Permit it to touch the floor about 2 ft. away and in front of the lower loop D. Cross the loops A and B, passing the left through the right, or A through B, changing hands as they pass, and the loops will be in the positions indicated at A and B, Fig. 4.

Move the left hand from B and grasp the front crossing of the loop at E, Fig. 4, as indicated at E, Fig. 5, and with a swinging motion of the left hand, draw the outer loop C, Fig. 4, upward and to position CC, Fig. 5. Reach through the loops A and B, as at F, Fig. 5, with the right hand and grasp the loop C, at the same time grasping the back crossing of the loops at G, Figs. 4 and 5. Holding the crossed loops G and the loop C in that position, open the fingers of the left hand, and permit the two loops forming the crossing E, to drop lightly forward into the third loop D, which has not been moved from its original position.

Do not drop the blade to the floor in the final stage of the process, in a spectacular manner, for this is likely to turn the edges of some of the teeth. The saw is now in the form of three circles, probably of different sizes, Fig. 6. Make them uniform by adjustment. Hang the saw where it will not be endangered. It should be unfolded correctly when used again, as blades are more often injured in unfolding than in actual use, or in folding them.

Some workmen pick up the loop with which the hands first come in contact and shake the blade until it straightens itself, so that it can be placed upon the machine. Sometimes this method results satisfactorily;

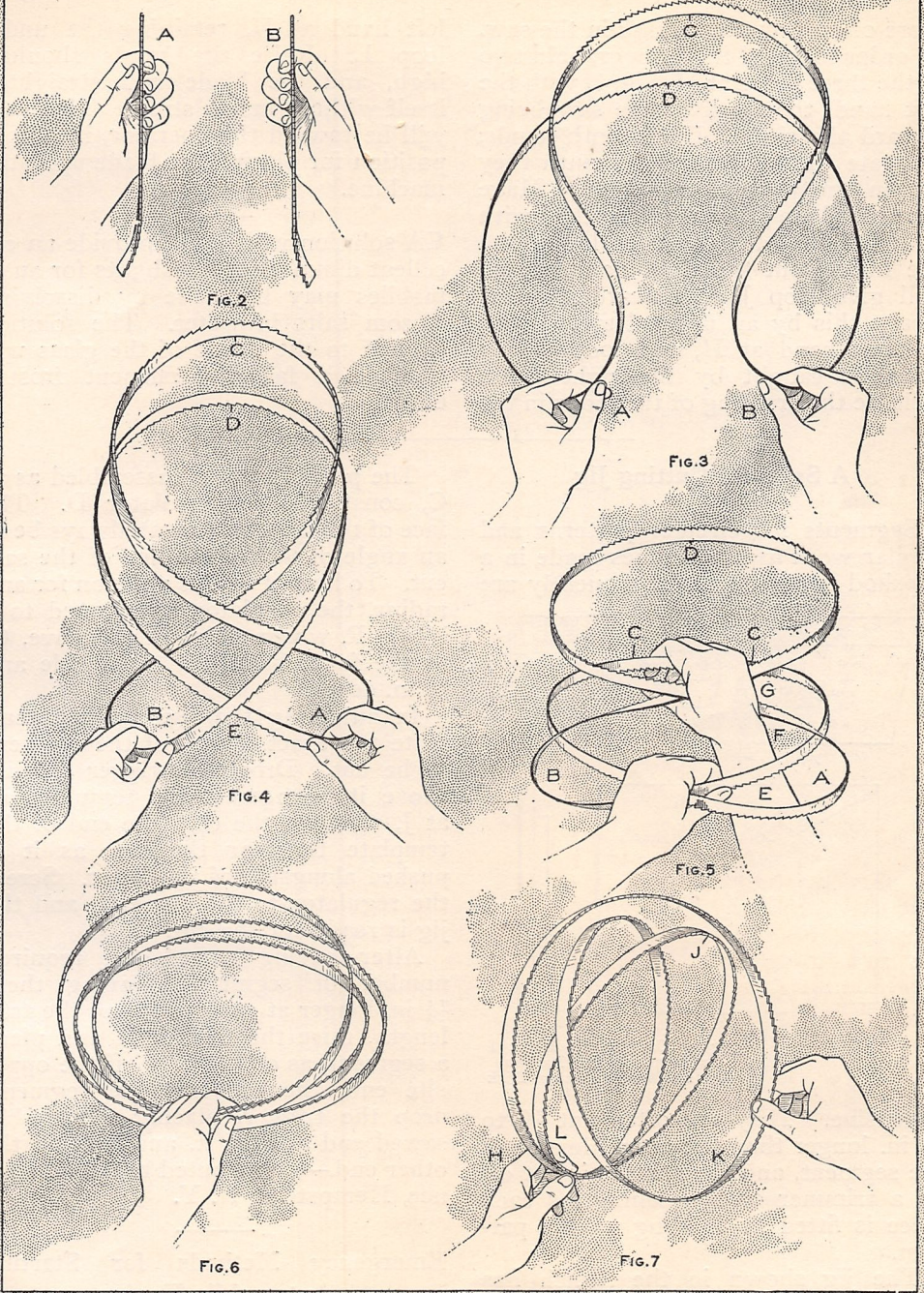


FIG. 2 FIG. 3 FIG. 4 FIG. 5 FIG. 6 FIG. 7

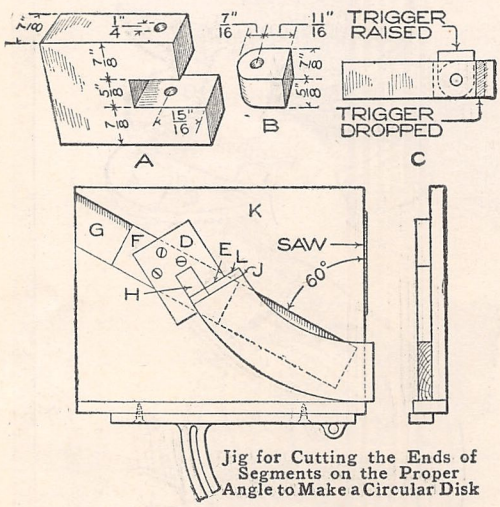
How to Fold and Unfold a Band Saw without Injury to Bystanders, Operator, or Saw: Grasp the Blade at the Middle of the Sides, Fig. 2, Thumbs on the Outside, Teeth toward Operator, Lower Loop Touching Floor Lightly; Turn the Thumbs In and Down, Fig. 3, Permitting Loop C to Touch Floor in Front of Loop D. Pass Loop A through Loop B, as in Fig. 4, Changing Hands. Draw Loop C Forward with Left Hand, Applying Pressure at E, Fig. 5, and Grasp Crossing G and Loop C in Right Hand, F. Release Hold of Left Hand at E, Fig. 5, Permitting the Three Loops to Spring Together, as in Fig. 6. Grasp Blade with Left Hand, as in Fig. 6, and Make Circles Uniform. To Unfold, Grasp Loop K in Right Hand, Fig. 7, and by Controlling Pressure at L Gradually Permit Blade to Spring Open

more often it causes a kink in the saw. In order to avoid this danger, hold two of the three loops at H, Fig. 7, with the left hand, the teeth of the saw being toward the right. Using both hands, separate the folds carefully until they are in the position indicated. Make sure that loop J is not interlocked with either of the others. Drop loop K to the floor from the right hand, which will give loop J an upward impulse. Assist this by an upward swing with the left hand at H, and loop J may then be caught by the right hand. Release the crossing of the loops in the left hand at H, retaining the under loop L. Raise the hands shoulder high, and the blade will straighten itself without undue strain. The teeth will be toward the operator, in proper position for placing the blade upon the machine.

¶A solution which will provide an excellent dimmer for headlights for automobiles may be made by dissolving Epsom salts in water. The solution applied to the inside of the glass will produce a fairly permanent frosted effect.

A Segment-Cutting Jig

Segments for circular patterns and similar work are sometimes made in a slipshod manner and consequently are



Jig for Cutting the Ends of Segments on the Proper Angle to Make a Circular Disk

expensive. They are often cut ⅛ to ¼ in. longer than the actual length of the segment, and the surplus is cut off on a trimmer or by planing, as each piece is fitted in building up the pattern.

The jig shown in the sketch has been found efficient and is for use on a circular saw. By its use the segments may be assembled as they are cut at the saw. Time is thus saved, and this method is further valuable in that the sawed ends have a superior gluing surface.

The parts A and B, assembled as at C, constitute the regulator D. The face of the regulator must always be at an angle of 60° to the line of the saw cut. To keep it in this position for any radius, the regulator is fastened to a block, F, which slides in a groove, G, of the fence board K, 1 in. wide and ¼ in. deep.

In adjusting the jig, make a template the exact length of the segment to be cut. Drop the trigger H, and shove it up against the template, as at J, allowing the opposite end of the template to clear the saw as it is pushed alongside of the latter. Screw the regulator to the fence K, and the jig is ready for the cut.

After having sawed the required number of segments, leaving them ¼ in. longer at each end than the true length, raise the trigger H and place a segment, as at L. Saw off the opposite end, then reverse the segment, drop the trigger, placing the freshly sawed end against it, and saw off the other end.—Contributed by D. D. Gurnee, Hempstead, N. Y.

Emergency Methods for Starting Automobile Engine

Occasionally the starter on an automobile fails to operate, and the driver is compelled to resort to the crank, if he is fortunate enough to have one. An emergency method for starting the engine may be used instead.

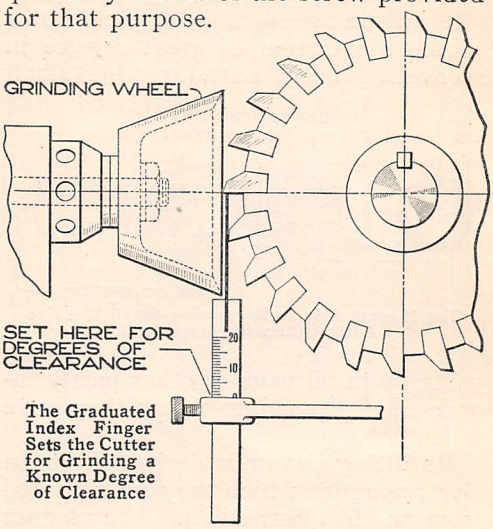
Throw the transmission gear into high speed. The car may be pushed along, causing the engine shaft to revolve, and unless there is something wrong, it should start after it is turned over a few times. It may also be pulled along by another automobile. This method is of service in starting an engine that has been taken down for repairs and must be worked into shape. Another method that may be resorted to, when neither help nor another car is available, is as follows: Put the gear into high speed, jack up one of the rear wheels, and turn the engine over by turning the raised wheel. In any of these methods it is best to have some one at the wheel to control the car. This is essential in the latter method.

Graduated Index Finger for Tool Grinding

Grinding cutting tools, such as reamers, milling cutters, boring cutters, countersinks, counterbores, and kindred tools, is usually a matter of guesswork in so far as the clearance is concerned, yet the clearance is as important as the quality of the tool steel used in the cutter. The sketch illustrates an easy method of substituting certainty for guesswork, and any angle may be produced perfectly.

The emery wheel used is cup-shaped and small. The cutter shown is carried on an arbor in the spinning head, or sometimes a special head is supplied with the tool grinder by the manufacturer. The spinning head is set square on the table, as is also the bracket, both being fastened with bolts. The index finger is held in the outer end of the bracket and is adjustable vertically.

The machine shown is set for a square cut; that is, no clearance. If the flat spring, shown in solid shade, is lowered until the figure 10 is flush with the top of the bracket boss, when the bracket is adjusted laterally on the table, the wheel will grind a clearance of 10°, and so on. While it is not necessary that the center line of the grinding spindle be central with the cutter, it is better to have it so if possible. The table is raised and lowered as required by means of the screw provided for that purpose.



The Graduated Index Finger Sets the Cutter for Grinding a Known Degree of Clearance

The index finger is easily graduated. If a 12-in. cutter is placed in the machine, the distance from the center is 6 in. If the tooth is lowered .5 in. from the horizontal, the face of the tooth will have an inclination of 1 in. to the foot, and so on. A table of "tapers and angles" will give the number of degrees and center line of this taper, or inclination, thus making the graduation easy and certain. Graduate in whole degrees only.

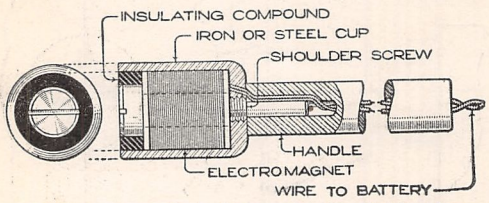
In the sketch the clearance shown is exaggerated to make it clear. Actual clearances cannot be given, as they vary with material, also for machines and general conditions, such as lubrication, degree of finish required, etc.—Contributed by J. B. Murphy, Plainfield, N. J.

To Surface-Harden Cast Iron

Small castings, such as gears, cams, etc., that are subjected to wear, can be made quite hard on the surface and toughened considerably by heating them to a dull red, then quenching them in a saturated solution of cyanide of potash while it is as near the boiling point as possible. An iron pot, filled with the solution and kept near the fire, will make it handy for the workman.

Small Lifting Magnet

Persons working about an automobile will find the lifting magnet shown in the illustration of great service in recovering bolts, nuts, or other small



The Magnet Aids in Recovering Small Machine Parts Otherwise Inaccessible

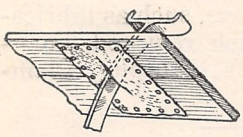
parts, from oil pans or other partly inaccessible places into which they have fallen.

Its lifting power is derived from an electromagnet which may be obtained from an old electric bell. The magnet is held in an iron, or steel, cup by means of a shoulder screw. Its power is derived from dry cells, which should be connected with the cords at the end of the handle.

An insulating compound should be used to seal the space between the head of the shoulder screw and the cup.

To Prevent Draft through Openings in Automobile Floor

The discomfort due to cold drafts coming through the openings in the floor of an automobile, around the various levers and pedals, may be greatly reduced by attaching a piece of rubber, or very heavy canvas, with a slit in it, on the under side of the floor, as shown in the sketch. This covering is especially serviceable on cars which have short mud pans, or none at all, as the chassis is very open under the floor of the front compartment, and the cold air may readily enter through the openings in the floor.



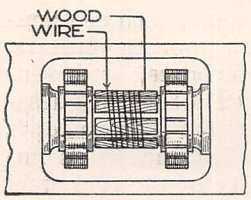
¶A hand reamer should never be used for power reaming.

Bleaching Linseed Oil

If it is desired to bleach linseed oil for some special purpose, mix it with some five per cent of peroxide of hydrogen in a tin, or glass, vessel and shake it from time to time. It will require only a few days to bleach the oil, which then may be poured off, the peroxide having been reduced to oxide of hydrogen, water. There are several ways of bleaching linseed oil which require about a month in making the change, but this is the simplest and quickest method.—Contributed by A. A. Kelly, Frazer, Pa.

Emergency Repair on Stripped Stuffing-Box Nuts

Stripped stuffing-box nuts on small steam, water, or air pumps are quite a common occurrence, and sometimes they cause considerable delay, as the application of a new stuffing box requires the removal of the pump heads, and the taking out of the piston, to get a new box over it.



Working near a construction job when a stuffing-box nut stripped from the box on a small water pump that was draining the water accumulating in a pit in which a number of men were working, I made the repairs as follows: Complete repairs to the pump would have delayed the work, with much damage to the pit and loss of time. The sketch shows the temporary repair. Small wood strips were cut and wired to the piston, the strips being of a length exactly the distance between the two nuts when both were securely drawn up against their respective packing glands. This made a very satisfactory repair that worked just as well as if the box and nut had been held together with perfect threads.

This kind of a repair can be used in almost every case where two packing nuts are within reasonable distance

from each other, on any kind of a pump, and will, in many instances, prevent a serious delay on important work until complete repairs can be made.—Contributed by F. W. Bentley, Missouri Valley, Iowa.

Waterproofing a Serving Tray

Serving trays are frequently spoiled by liquid coming into contact with the embroidery, picture, or other work which may be placed beneath the glass to beautify the tray. In order to prevent this, a water-tight joint between the edge of the glass and the edge of the tray, extending over the glass, should be made.

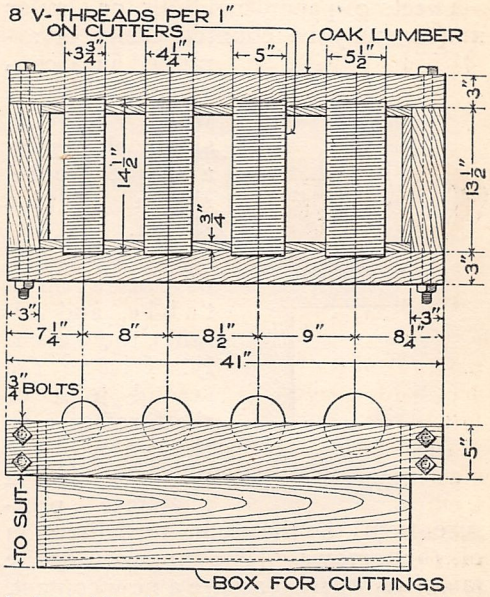
To do this, bicycle tape, about 7/8 in. wide, should be inserted into the joint. Remove the bottom from the tray, and then the glass. Clean the inner edge of the tray frame of glue and rough spots. Press the tape into the square corner around the edge of the frame. The four corners may be turned by cutting the tape on the upper edge and stretching it into the proper form. If the tape is cut in two at the corners there is more likelihood of a leak. The open spaces in the corners should be filled with small pieces, but care must be taken not to form lumps. Replace the glass and see that it rests evenly on the tape all the way around, and reassemble the tray.

A Bearing Scraper

When old journal bearings need rebabbitting they are usually placed in a former and babbitted. Often it is necessary to true up the bearing with a scraper. This method is not satisfactory, as it does not give a true bearing surface and leaves some high spots.

A better arrangement for truing up babbitt in bearings is shown in the illustration. The four cutters are made of steel and threaded with eight V-threads to the inch. When it is desired to true up a journal bearing it is placed upon the appropriate cutter and rubbed back and forth until a true bearing surface is obtained.

The shavings from this operation drop into the wooden box below, which may be cleaned readily from time to

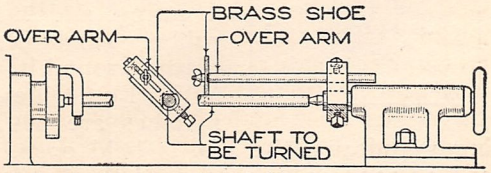


A Journal-Bearing Scraper That will Insure True Bearing Surfaces

time. Whenever desirable the cutters may be revolved in order that all parts of the threaded portion may be used.—Contributed by J. R. Minter, Washington, Ind.

An Over-Arm Steady Rest

The over-arm steady rest shown was designed to hold long shafts of small diameter while machining them, without using a cumbersome steady rest. A steel block was bored out to fit the tailstock spindle, and also had a hole drilled in it to receive the over-arm bar, both holes being fitted with set-screws. The end of the bar was drilled

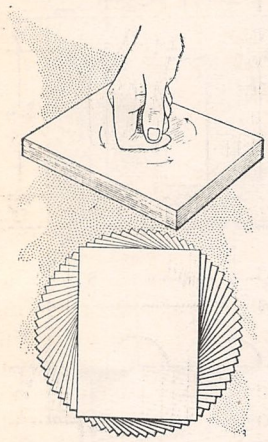


A Handy Over-Arm Steady Rest for Lathe Work on Long Shafts of Small Diameter

and tapped, and a stud screwed in. A slotted brass shoe, a washer, and a wing nut completed the outfit.

Kink for Counting or Grasping Paper Sheets

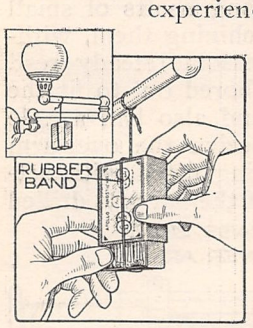
Sheets of paper, handbills, or similar matter, may be counted easily or arranged in a convenient pile from which to take single sheets by a simple process shown in the sketch.



Place the pile of sheets on a table, and arrange them evenly. Place the second joint of the forefinger on the center of the pile, and with a moderate pressure turn the hand in the direction of the arrows. The finger may be raised in order to secure a new contact. The result will be surprising, and interesting to observe. A pile of sheets, as shown in the lower figure, will result.—Contributed by George H. Holden, Hill-Crest Lodge, Chesterfield, England.

Match Safe Attached to Gas Fixture

Finding matches in the dark in order to light a gas fixture is often a trying experience. Suspending a match safe from the fixture, as shown in the illustration, solves the difficulty. The match box is suspended on a string and a rubber band is placed around it. While the matches are being withdrawn the box is held open, and as soon as it is released the band closes it. This makes it safe to strike the match on the box without danger of igniting other matches.—Contributed by J. Davis, Poughkeepsie, N. Y.

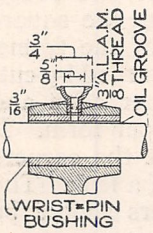


Repairing Broken Rubber on Wash Wringer

While washing one day some time ago, I had the misfortune to damage the upper roller on my wringer, and wishing to finish quickly, I repaired it in the following manner: I wrapped a piece of stout bandage, about 4 in. wide and 18 in. long, tightly around the injured roller. This was intended to be used only temporarily, but it served so long that I found it unnecessary to procure a new roller.—Contributed by Mrs. Anna M. B. Romig, Allentown, Pennsylvania.

Oiler for a Connecting-Rod End

The upper portion of a connecting rod on an automobile engine is lubricated by the oil splashed in the crank case, but in quite a few cases this method does not work satisfactorily. In making repairs on an engine where the bushings were burned out, caused by inefficient oiling, an attachment was tried out with success. This consisted in making a small oiler, similar to a regular oil cup, and screwing it into a hole drilled and tapped into the upper part of the bearing. An oil groove was cut in the new bronze bearing to connect with the hole of the oil cup. It was easy to maintain a constant supply of oil to the bearing with this device.



Repainting Exterior Woodwork

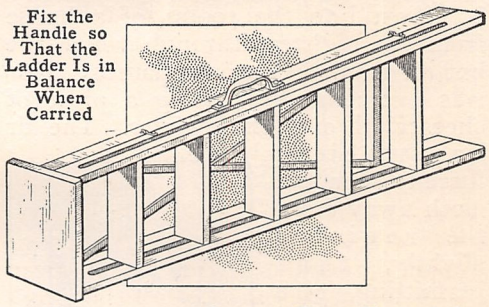
Exterior woodwork painted the first time fails to show as good and lasting a result as when it has been painted again after two years' wear. Repainting over a good white-lead surface that has become dry and floury will yield a good wearing finish. The chalking of white-lead paint is no disadvantage, for in this condition it will take the new paint better than a hard surface, and will not scale.

Emergency Electric Switch

When a temporary electric switch is needed in the home, or shop, where a stock of electrical supplies is not available, a satisfactory switch may be made of a lamp socket and key. In order to transform a socket into a switch, screw a fuse plug into the place intended for the lamp. The circuit may be opened or closed by turning the key as if turning on or turning off a light. Fuse plugs for the purpose are usually to be found in a home, as they should be on hand to replace fuses blown out.—Contributed by F. W. Buerstatte, Pullman, Wash.

Carrying a Stepladder

A handle, fixed on the side of a stepladder so that the ends balanced, overcame the difficulty ordinarily experienced in carrying it. It is worth while to spend sufficient time in fastening the handle to insure that it will be

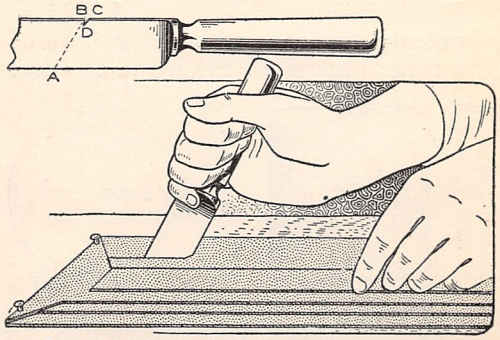


at the proper place.—Contributed by W. C. Loy, Rochester, Ind.

Making Reliners Out of Old Tires

Reliners, with which to support portions of automobile or other tires worn considerably, may be readily made out of old tire casings. The tool necessary for the trimming of the casing into a reliner, with a featheredge all around, as shown in the sketch, may be made from a table knife.

Nick the surface of the knife blade with a cold chisel on a diagonal as at AB. Grind the edge along this line smooth, after breaking the blade by striking it a sharp blow as the point end of the blade is held fast in a vise or clamp. The jaws of the vise or



Insert the Point of Knife into Top Layer and Cut along Line

clamp should be even with the line AB. Now grind a V-shaped nick into the back edge of the blade as shown at C. Grind the edge BD as sharp as possible and smooth off the other adjoining edges.

The material for the reliners is obtained as follows: Cut out the better portions of an old casing, in such a way that the cut edges would be in direct line with the spoke nearest them, if the tire were on a wheel. Then cut off the tire beads by which it was held in the rim. Rip off the more badly worn outer layers from the casing.

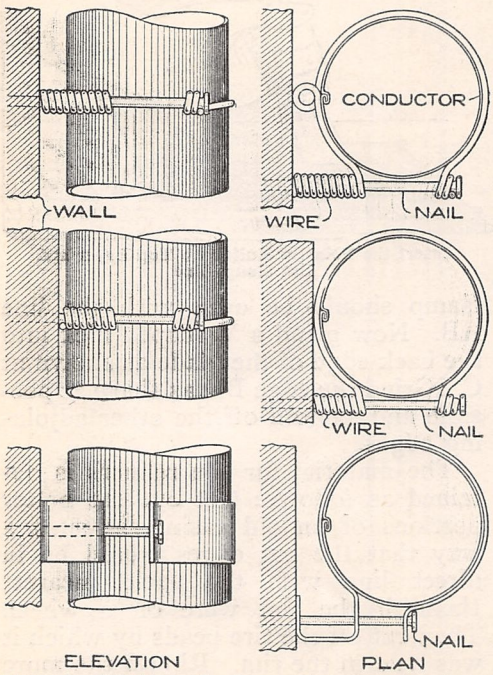
Lay the section of the casing flat on a bench, the inner side down. With a pencil, or a piece of crayon, mark off the "steps" in the several layers of the casing by the cutting of which the featheredge is to be produced, gradually thinning out. Insert the point B of the knife into the top layer and trim along the chalk line, cutting the smaller of the oblongs shown. Repeat this process, tearing away the outer portions of each layer, around the oblong for that layer.

The reliners may be made of various lengths and breadths to meet the requirements of tires of various sizes and worn portions of similar range.—Contributed by H. W. Bohrman, Los Angeles, Cal.

¶Dirty materials will not make first-class concrete, either in strength or appearance.

Conductor-Pipe Holders

Three designs are shown of holders for conductor pipes on houses. Two of the three illustrated are made of wire,



Methods of Holding Conductor Pipe by Using Only One Nail with Wire or Sheet Metal

coiled about a nail and around the pipe, and the third consists of a strip of sheet metal, all three being fastened with a nail driven into the siding. These holders have considerable advantage over the ordinary hook and will hold the pipe firmly in place.

Surfacing Tracing Cloth to Take Fine Ink Lines

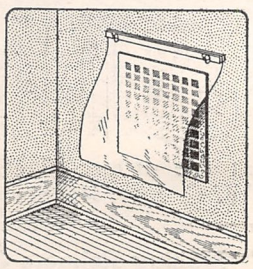
Many methods are in use for preparing the surface of tracing cloth to receive the ink, but I have found the following way to work best where very fine lines are to be drawn. The dull, or unglazed, surface of the cloth is used, and after stretching the cloth on the board, it is sized as follows. Moisten the cloth well with gasoline and go over the entire surface, rubbing lightly to remove all dirt and surface grease. While the cloth is still wet with the gasoline, sprinkle well with talcum powder of the grade used in automobile tires, and then rub vigorously. This fine abrasive roughens the surface so that fine, close-drawn lines take well. Wipe clean, and the tracing cloth is ready for use.—Contributed by M. Burr Bennett, Bridgeport, Conn.

Light-Saving Kink

Electric-light bills are sometimes increased needlessly through permitting light to burn unnoticed in the pantry, coal room, or other small rooms. I cut round holes in the upper panels of the doors of these rooms and placed glass in them. This caused the otherwise forgotten lights to attract attention, and there was small likelihood of these lights burning needlessly. — Contributed by John Hoeck, Alameda, Cal.

Aprons for Hot-Air Registers

It is a common experience that dust is blown into the rooms of a house from the registers through which the hot air from the furnace passes. This was overcome by placing a piece of cheesecloth over the register. The air has sufficient force to blow the cloth away from the register slightly, thus permitting the warm air to enter, while most of the dust is caught in the cloth.



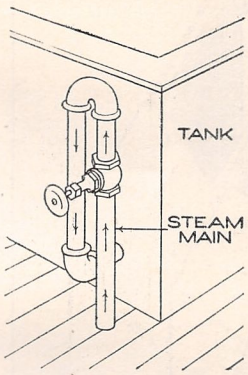
The strips by which the cloth is held can be made of wood and finished to match the woodwork of the room. The bolts are fastened in the piece of wood nearest the wall and holes are bored in the front piece at corresponding points. The piece in which the bolts are secured is then fastened to the wall with screws, care being taken that they strike the studding. By releasing the wing nuts fresh cloth may be inserted. —Contributed by J. A. Fitzpatrick, Altoona, Pa.

Sanding Track for an Automobile

Occasionally in winter when the streets are covered with ice an automobile gets stuck in a rut, or for some other reason the wheels turn around without moving the car. This sometimes happens even if the car is equipped with chains. This difficulty can be easily overcome by carrying a box, or bag, of sand under the seat and sprinkling it on the surface under the wheels, as in sanding the track on a railroad.

Preventing an Alkaline Solution from Backing into Boiler

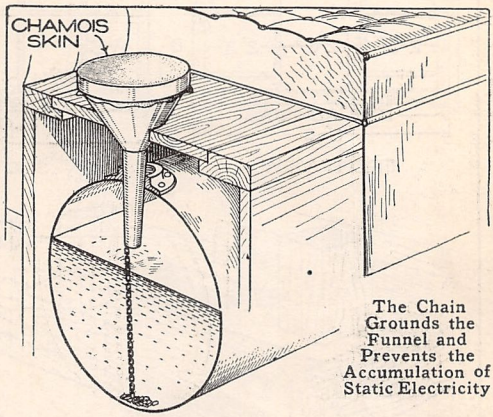
A hot alkaline solution used in an establishment had a way of attacking the seat of the steam valve and forcing its way back into the boiler, causing the water in the boiler to foam. A steam fitter rigged up the device shown in the illustration so as to prevent the solution from coming in direct contact with the seat of the steam valve.



To Prevent Fire While Pouring Gasoline through Chamois Skin

Fires occurring without apparent cause while gasoline was being poured into automobile tanks through chamois skin were found to have been caused by electric sparks from ungrounded funnels. The pouring of gasoline through chamois skin develops static electricity, which accumulates in the funnel, if it is set into a wooden seat or similar place while in use.

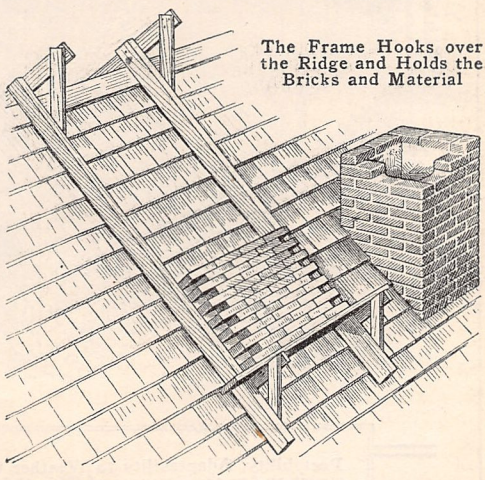
When a considerable accumulation has taken place a sharp contact of the funnel and the metal edge of the tank may cause a spark, resulting in an explosion. In order to prevent the accumulation of electricity the funnel should be grounded by fastening a light chain to it, as shown in the sketch. The chain should be long enough to remain in contact with the bottom of the tank.—Contributed by E. A. L., Ames, Ia.



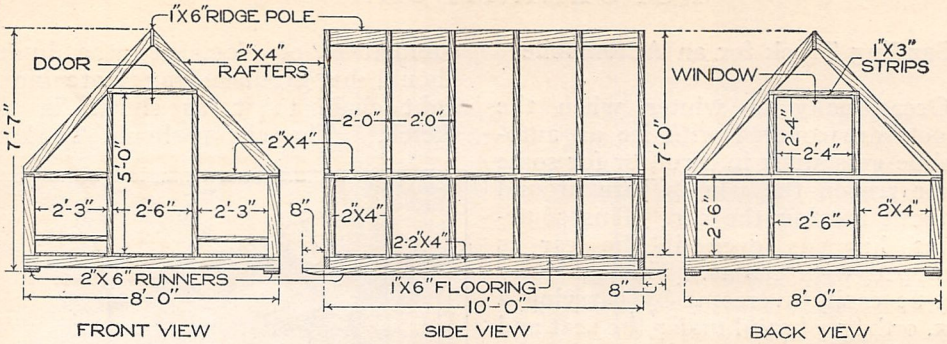
The Chain Grounds the Funnel and Prevents the Accumulation of Static Electricity

Supporting Bricks on a Roof for Chimney Construction

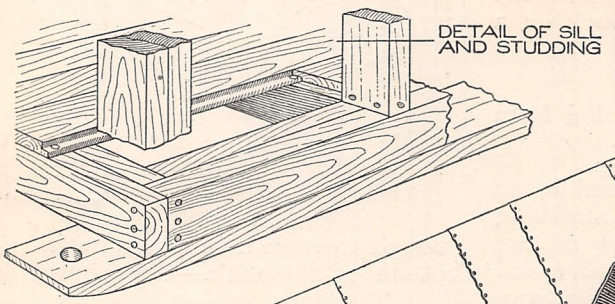
Bricks and material for the reconstruction of a chimney may be safely and conveniently placed on a roof by using the frame shown in the sketch. It is simple in construction and requires less lumber than a platform. The latter, if rested on the roof gutter, may cause damage, and if the gutter is not in good condition an accident may result.

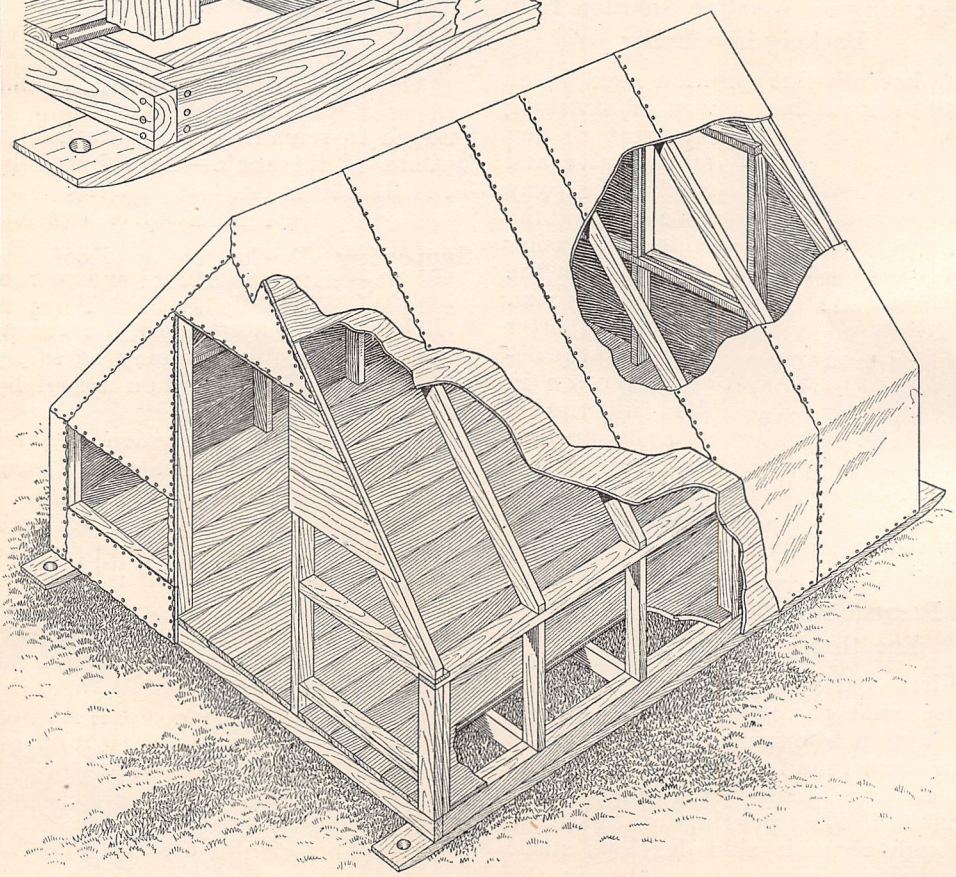


The Frame Hooks over the Ridge and Holds the Bricks and Material

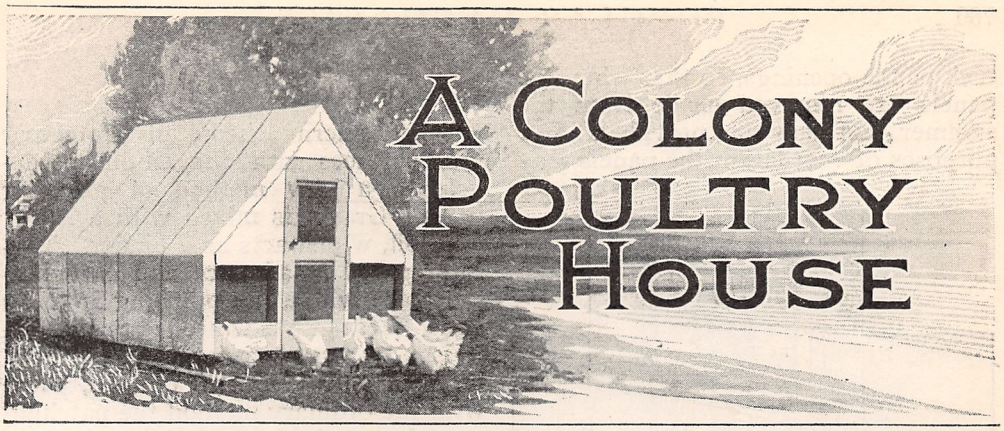


SKELETON VIEWS OF THE FRAMING





Portability, Adaptability to Weather Conditions, Low Cost, and Simple Construction Are the Features of This Colony Poultry House. The Pieces for the Framing Shown Above may be Cut Advantageously from 10-Foot Lengths of Two by Four-Inch Lumber. The Sketch Shows the Details of Construction without Door and Panels



A Colony Poultry House

By W. E. FRUDDEN

PORTABILITY, adaptability to weather conditions, low cost, and simple construction are the features of the colony poultry house shown in the illustration. It is in use on a farm in Iowa and has been found satisfactory for 20 hens for the winter, and for the raising of chicks in flocks of over a hundred. It is built on skids so that it may be transported on rollers. Ventilation and shade are provided for with screens. For winter use, there are hinged doors, which may be lifted off easily in the summer.

The lumber for the house is all standard-size stock. The frame is built of 2 by 4-in. material, joined at the sill and corners to form 4 by 4-in. sections, and the skids are of 2 by 6-in. planks. The floor and sheathing boards are 6-in. shiplap. The house is covered with a prepared-roofing material.

Diagrams of the framing are shown in the upper figures of the plate of illustrations. The skids may be shaped first. Next spike together the sill of 2 by 4-in. material, as shown in the detail of sill and studding, and nail the skids in place.

Plan to cut all the pieces of the same size in a series, and make a measuring stick, or template, for each, particularly the rafters. Nail the floor joists into place, then the studding, door and window frames. The plate, which is nailed on top of the studding, should be fixed with a half-lap joint at the corners.

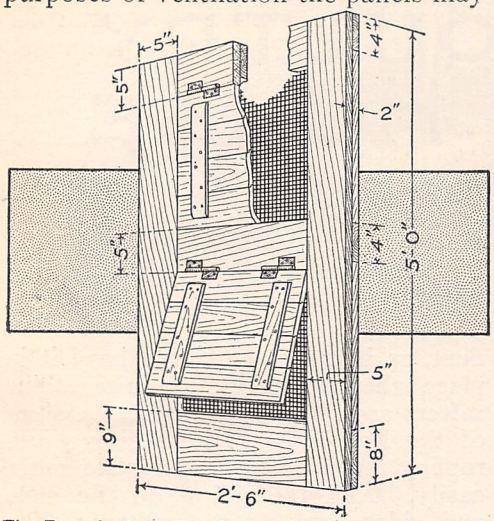
The floor should be nailed down next, as it is convenient to have it in place when the rafters are raised. The rafters are cut off flush with the sides of the house so that the siding and roofing material may be applied more easily. Nail the siding on the ends and sides, and on the rafters. The house may then be covered with roofing material.

The casements for the window openings should be made next. They are made of 7/8-in. material, 3 in. wide, one edge being nailed flush with the inner edges of the framing around the openings.

Details of the construction of the door are shown in the smaller illustration. It is built up of two thicknesses of boards, arranged so that the joints are reinforced, the horizontal rails on the inner side crossing the joints which appear on the front. Screws should be used to fasten together the pieces of the door, although properly clinched nails may also be used. The strips forming the inner side of the door are 1 in. narrower than those on the front, so that the 1/2-in. wire mesh may be fastened in place by quarter-round molding.

The panels in the door are similar in construction to those to be fitted into the other openings, at each side of the door and at the gable end of the rear of the house. The hinges are of the type used on storm windows, and permit the panels to be lifted off when raised nearly vertical. Oiled muslin may be fitted to hang by the upper edge in

each of the openings, so that when the panels are removed shade from the summer sun may be provided. For purposes of ventilation the panels may



The Door is Built Up of Two Thicknesses Arranged to Reinforce the Joints

be opened or removed temporarily. If the window in the rear-gable end is not provided, a ventilator should be placed at the ridge. Roosts may be built in the rear part of the house, and nests arranged along the sides in the space adjoining the door, but not too close to the ventilating openings.

The stock bill for the construction of the colony poultry house is as follows:

2 pieces, 2 by 6 in. by 11 ft., 4 in., for skids.
1 piece, 1 by 6 in. by 10 ft., for ridge pole.
5 pieces, ⅞ by 3 in. by 10 ft., for casings, for openings.
2 pieces, ⅞ by 9 in. by 10 ft., for door.
30 pieces, 2 by 4 in. by 10 ft., for framing.
330 ft., ⅞ by 6 in. by 10 ft., shiplap flooring for floors, sides, and roof.
2 pieces, ⅞ by 10 in. by 10 ft., for nests and fittings.
250 sq. ft. roofing material for outer covering.

Improvised Buttonhook

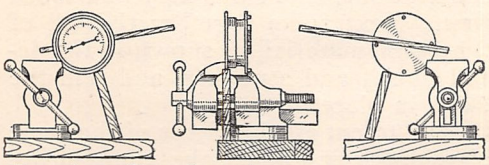
Time, temper, and finger nails may be spared by using a string as an improvised buttonhook in emergencies. The twine should be fairly strong, and a loop should be pushed through the buttonhole, hooked around the button, and drawn through the hole, bringing the button into place easily and quickly.—Contributed by W. W. Baldwin, Washington, D. C.

Road Patching

The modern scheme of protecting road surfaces with sprayed oil has developed a new method of patching holes. Gravel is mixed with a heavy road oil, which acts as a binder. This is prepared in advance and carted to the place where the patching is to be done. Less gravel is needed than when it is used dry, because the hole need be filled only level and tamped, while with the ordinary method the patching gravel must be heaped above the normal surface of the road. Where patching on a large scale is to be done, a concrete mixer can be used to prepare the mixture.

Removing Steam-Gauge Dial-Glass Casings

Steam-gauge dial-glass casings are often hard to unscrew from the body of the gauge, due to the heat, and other influences, to which the gauge is continually subjected. This is aggravated by the fact that the covers are difficult to get hold of, and that it is not practical to apply any strong gripping device because of the danger of rupturing the material. The sketch shows how they can be removed with but very little trouble. One side of the gauge is lightly pinched between protected jaws of a vise, and the lower portion of the cover is set on a block of wood. Two bolts are placed in the holes in the back side of the body, and a narrow strip of metal is used as a lever. Any dial cas-



Removing a Glass-Cover Casing on a Steam Gauge with the Aid of a Vise

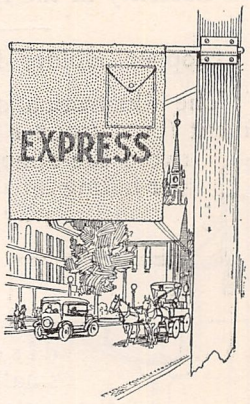
ing, after it has been turned one revolution, can be easily removed by hand. Getting it started is the difficulty. The most obstinate cover casing can be removed in this manner with no danger of disfiguring or rupturing it.

Preventing Rust under Molding on Screen Frames

Window-screen wire usually gives away near or under the small strip of molding that holds it to the frame. This is caused by the dampness retained in the joint after a rain, which results in the wire rusting. In placing new wire on a frame, be sure to paint it well on the edge after tacking it to the frame and before applying the molding.

Order Holder on an Expressman's Signal Flag

An expressman in a small city had the local druggist act as his agent. Orders received by the agent were written on slips of paper and placed in a pocket on the signal flag, which was placed in its socket beside the door to inform the expressman that he should call. Considerable delay in making inquiries for possible orders was thus avoided.—Contributed by Harry L. Dixson, Chicago, Ill.

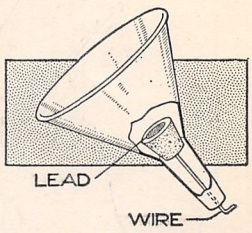


Sharpening Scraper for Heavy Cut

Scrapers for finishing wood surfaces may be sharpened on their several edges for both light and heavy cuts, and this arrangement will be found more convenient than sharpening all the edges in the same manner. For light cuts, the edge of a scraper should be filed and honed square to the side of the scraper. For a heavy cut it is better to file the edge at a slight angle, and to turn over the acute corner with a round steel rod or a burnisher, rubbed along the edge with considerable pressure.—Contributed by L. E. Fetter, Portsmouth, N. H.

To Prevent Spilling Water on Automobile Radiator When Filling It

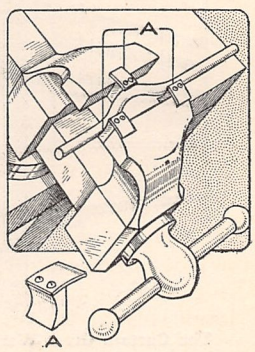
When filling an automobile radiator it is almost impossible to keep from spilling the water over the outside unless extreme caution and considerable time is taken at the end of the filling. The spilling can be prevented by making a stopper to fit the inside of the funnel in the small end. The stopper should be made of material that will not float. A cork will do, if a recess is formed in the center and filled with lead. A small wire, extending down from the lead and with the end turned, will provide a means of raising the stopper by pressing the bent end against the radiator filler. Just as soon as the funnel is lifted the stopper falls into place and prevents the water remaining in the funnel from spilling over the outside of the radiator.



Straightening Small Rods in a Vise

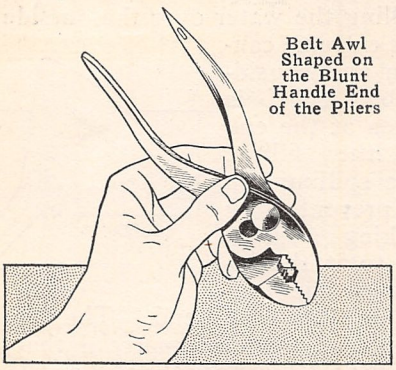
Rods of some length and a diameter of an inch or even more may be straightened by the use of a comparatively light hammer, but the straightening of short rods is more difficult. This may be accomplished without marring the surface of the rods by the use of the grooved vise pads A, shown in the sketch.

The pads should be made of copper or other moderately soft metal. The small strip riveted to the top of each pad will make it possible to use the three pads without using the hands to hold them in place.



Belt Awl on Plier Handle

Having quite a number of belts to lace about the shop, I often found it necessary to use a belt awl and also a

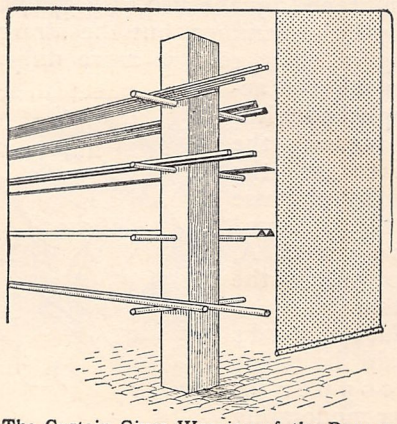


Belt Awl Shaped on the Blunt Handle End of the Pliers

pair of pliers. Having to lay one tool down to use the other is sometimes inconvenient, as they are apt to drop out of reach, or to the floor if working on a high place. To make my pliers so that I would have both tools in one, an awl was formed on the end of one of its handles.—Contributed by Chas. G. England, Washington, Pa.

Curtain Guard for Blacksmith's Stock Rack

Danger from contact with exposed ends of iron bars in blacksmith shops is overcome by the device shown in the



The Curtain Gives Warning of the Danger

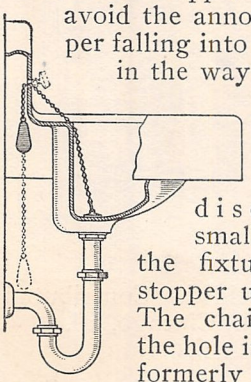
sketch. A curtain was hung at each end of the stock rack so that when there was danger of striking the exposed ends the curtain gave warning. This device was found to be of especial advantage where the stock rack is placed in a dimly lighted portion of the shop. The curtain may be drawn aside or arranged to lift to the ceiling with a cord, when stock is being removed.—Contributed by J. J. O'Brien, Buffalo, N. Y.

Improving Compression on Small Engines

When the piston rings of small motorboat and automobile engines become so loose that they will allow a loss of compression, the difficulty can often be overcome by placing a piece of corset steel behind them. The spring of the corset steel makes up for the lack of elasticity in the rings.

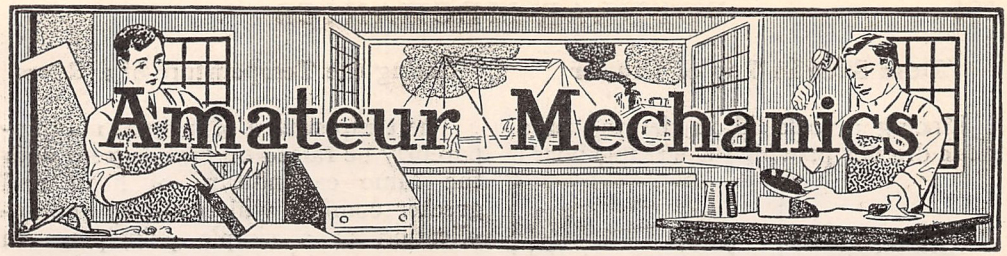
Stopper Holder for a Lavatory

The illustration shows an arrangement for a stopper in a washbasin to avoid the annoyance of the stopper falling into the hole and being in the way when it is desired to clean out the basin. When the stopper is released from the discharge pipe the small weight back of the fixture will pull the stopper up out of the way. The chain passes through the hole in the fixture which formerly held the ring at the end of the chain.—Contributed by B. O. Darrow, Sacramento, Cal.



Tempering Thin Pieces of Steel

It is often difficult, after hardening small, thin pieces of steel, to draw them to the required temper without unevenness. Flames and fires are apt to be hot in spots or so intense that the article is not heated evenly. To avoid this, heat sand in a metal dish and dip the article in it, moving it continually until the required color is obtained. The sand must not be too hot, and the article must be bright.



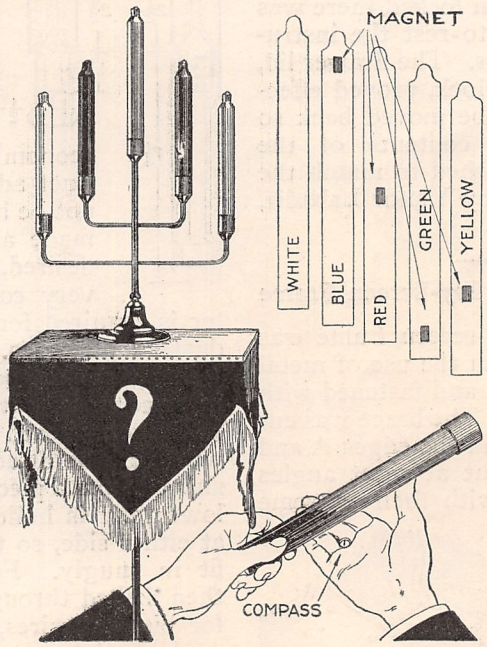
Magic Candles Explained

By CLIFFORD WAYNE

CLEVER and baffling though it may be, the magic-candle trick may be performed easily and with professional skill by a person who has made a few simple preparations. The illustration shows the candles arranged on a table made of a music stand.

Candles, cigars, or pencils may be used, but for the purpose of this description the former will be used. The candles are of different colors but of the same size and weight. The manipulation is as follows:

Exhibit a tube of brass, cardboard, or other suitable material, just large enough to contain a candle. Then retire from the room, leaving the tube on the table while one of the spectators selects one of the candles and places it into the tube, covering the end of the latter securely with a small cap. The other candles are hidden before the performer is permitted to return. The trick is to announce the color of the candle contained in the box by merely passing the hand over it several times. The box and candle are passed out for inspection and will bear it if properly prepared.



Mysterious Passes over the Concealed Candle are Made and Its Color Announced

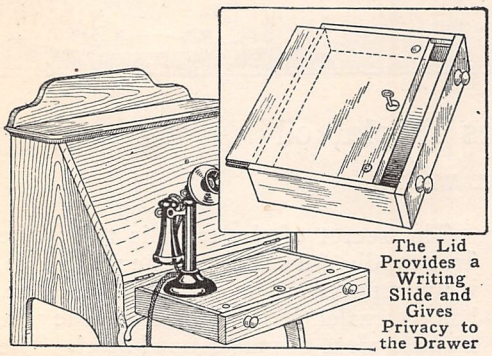
The secret of the trick is this: The first candle, for example, the white one, is unprepared. The second, a blue one, has concealed in it, ½ in. from the top, a small piece of magnetized steel. The third candle, a red one, has a similar bar concealed at the middle; the fourth, a magnetized bar ½ in. from the bottom, and the fifth candle has the bar at a point halfway between the middle and the bottom. The candles are made of wood and the magnets may readily be imbedded in them. They are made of two pieces glued together like a pencil.

The performer hides a small compass in his palm. It is held in place by a wire clip, gripped between the second and third fingers near the knuckles. A wave of the hand over the tube containing a candle will affect the compass if any candle other than the white one is used. Its needle will vibrate when approaching the concealed magnet, and by determining quickly the position of the magnet, the color may be announced.

Those who offer guesses usually insist that some electrical device is used.

Desk Slide in Top of Drawer

Placing a lock lid in the top of a desk drawer provided a writing board



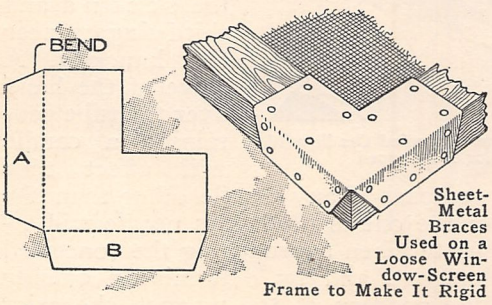
The Lid Provides a Writing Slide and Gives Privacy to the Drawer

and also gave privacy to the drawer, as shown in the sketch.

A lady's desk in a nicely furnished room was used for the telephone and as the desk was often locked there was no place on which to rest the instrument or to take notes. The drawer lid, locked with a chest lock, proved effective. The lid may be moved back so as to expose the contents of the drawer. It was finished to match the desk.—Contributed by Victor Labadie, Dallas, Tex.

Repairing a Broken Fly-Screen Frame

An old broken fly-screen frame was made quite rigid with the use of metal braces, cut as shown and fastened with nails to each corner. The brace was cut from sheet metal, and the edges A and B were cut and bent at right angles to the main part, with their extreme



Sheet-Metal Braces Used on a Loose Window-Screen Frame to Make It Rigid

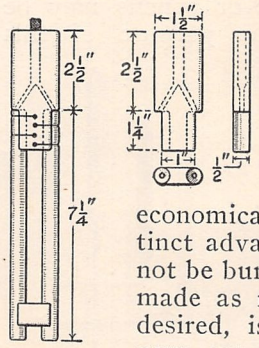
edges bent over the frame. These were sufficient to make the frame as rigid as a new one.

Raising the Temperature of a Room

The temperature of a room may apparently be raised several degrees with the same expenditure of heat, and greater comfort will result by the application of a simple principle. In summer a moist day seems warmer than a dry one though the thermometer registers the same. By permitting steam to escape from a radiator or keeping a kettle boiling on the stove, the air is moistened and feels warmer.

A Carbon Electric Water Heater

The water heater illustrated is for use on a 110-volt circuit without added resistance. It consists of two electrodes which are immersed directly in the water; and while it is not as artistic as the usual nickel-plated heater, it is usually more economical and has the distinct advantage that it cannot be burnt out. It may be made as rapid in action as desired, is inexpensive and very convenient where water is required for experimental or industrial purposes.



For the electrodes, procure two ½-in. uncoppered carbons, and drill a hole in the top of each of these so that feed wires can be attached. The handle is shaped from a piece of hard wood. The lower end is hollowed out half round at either side, so that the carbons will fit in snugly. Four small holes are then drilled through from side to side, for binding wires, and a large hole is made in the center for the feed wires. Two smaller branch holes are then drilled to join the center hole, so that the double feed cord may be branched out to reach both electrodes. The outer edge of the handle is neatly rounded off and boiled in paraffin so as to render it impervious to moisture.

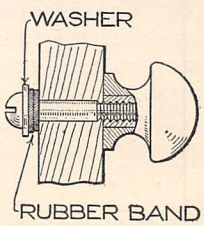
Remove sufficient insulation from the feed cord to make a good connec-

tion with the carbons. Fish the wire through the handle from the upper end. Pull each of the two ends pretty well through, so that they can be securely leaded into the holes previously made in the carbons. Have the latter quite hot and run in as much solder as possible, forcing it in with the end of a match as it becomes plastic. Remove all traces of the flux, and paint the connection with some melted pitch, taken from the top of a discarded dry cell. The feed cord may then be pulled up tightly, which will draw the carbons in place. They are then bound by threading through several strands of copper wire. If the holes in the wood are slightly countersunk, and two small grooves filed around each carbon at the right places to let the holding wires in, the binding feature may be disposed of very neatly.

In some localities the water is so free from all mineral salts that it will not carry the current freely, which means that the electrodes must be placed closer together, or else a small pinch of common salt may be added to the water. Although, in sterilizing instruments, boiling eggs, or something of that sort, this would be of no advantage, the salt greatly hastens the boiling.

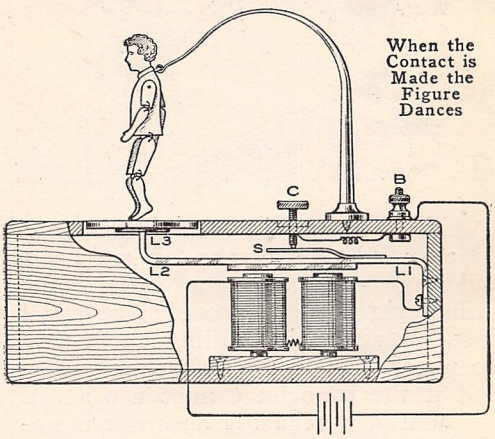
Preventing Looseness of Drawer Handles

Drawer handles frequently become loosened and sometimes cause further annoyance by falling to the floor or becoming lost, because the bolt fastening, as shown in the sketch, is not secure. This may be avoided by inserting a rubber band between the head of the bolt and the drawer front. When the knob is drawn up tightly the pressure of the rubber band prevents it from becoming loosened.—Contributed by O. F. Germaine, Akron, Ohio.



An Electrical Dancer

The modification of the well-known mechanical dancer shown in the illustration is based on the principle of the



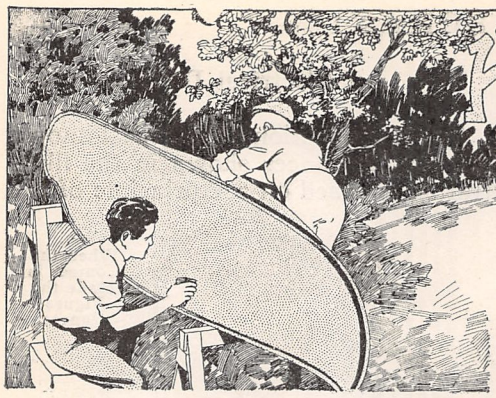
electric bell. While the amusing antics of the mechanical dancer are controlled by the hand, the manikin shown is actuated by the electromagnet.

The mechanism is contained in a box. It consists of an electromagnet with a soft-iron armature carried by a spring. A wire from the battery goes to the magnet. The other terminal of the magnet connects with the armature spring at L 1. The spring is bent at a right angle at its other end, L 2, and carries a platform, L 3, strengthened by a smaller disk underneath. The dancer performs upon this platform.

A contact spring, S, is carried by the armature spring. A contact screw, C, is adjustable in its contact with the spring S. A wire runs from the contact screw to the binding post B, to which the other battery wire is connected.

The current keeps the platform in constant vibration, causing the dancer to "dance." By means of the screw C, the action of the current may be varied, and the "dancing" will vary correspondingly.

The figure is made of wood with very loose joints and is suspended so that the feet barely touch the platform.—Contributed by Edward C. Connelly, Wilkesbarre, Pa.



How To Build A Canoe

By Stillman Taylor

PART II

Sailing the Open Paddling Canoe

SAILING and its recreations are afforded the owner of an open paddling canoe, for a satisfactory sailing rig may be provided at small cost. A regulation sailing outfit may be purchased, but it is rather costly, and if the canoeist cannot use a sail frequently, purchasing an outfit is unduly expensive. A sailing rig may be constructed even by one of only moderate skill, who will devote a few hours to it. The specifications given, if carefully followed, will enable one to make a sailing rig as serviceable as a ready-made outfit, and at about one-half the cost.

The specifications and list of material for a sailing outfit suitable for a 16-ft. open canoe are as follows:

1 piece bamboo, 1½ in. in diameter, 6 ft. 10 in. long, for mast.
2 pieces bamboo fishing rod, 1 in. at butt, 10 ft. long.
1 piece, cedar or white pine, 5 ft. long, 4 in. wide, and ⅞ in. thick, for leeboard thwart.
2 pieces, cedar or pine, 28 in. long, 10 in. wide, and ⅜ in. thick, for mast thwart.
1 piece, cedar or pine, 27½ in. long, 3½ in. wide, and ¾ in. thick, for mast thwart.
1 piece, cedar or pine, 5 in. long, 2½ in. wide, and 1 in. thick, for mast step.
8 yd. unbleached cotton sheeting, 1 yd. wide, for making sail.
30 ft. ¼-in. cotton rope, for halyard and main sheet.
4 brass lantern-board hooks, for clamping mast thwart and leeboard thwart to canoe.
2 brass stove bolts, 3 in. long and 5/16 in. diameter, with washers and thumb nuts, for clamping leeboards at desired angle.
1 brass single-boom jaw for canoe, 2 in. long, for keeping boom on mast.
3 brass screw eyes, 1½ in. long with ½-in. eye, one for halyard, two for spars.
1 brass split ring, 1½ in., for fastening ends of spars together.
1 brass "S" hook, 1¾ in. long, for fastening ends of spars.

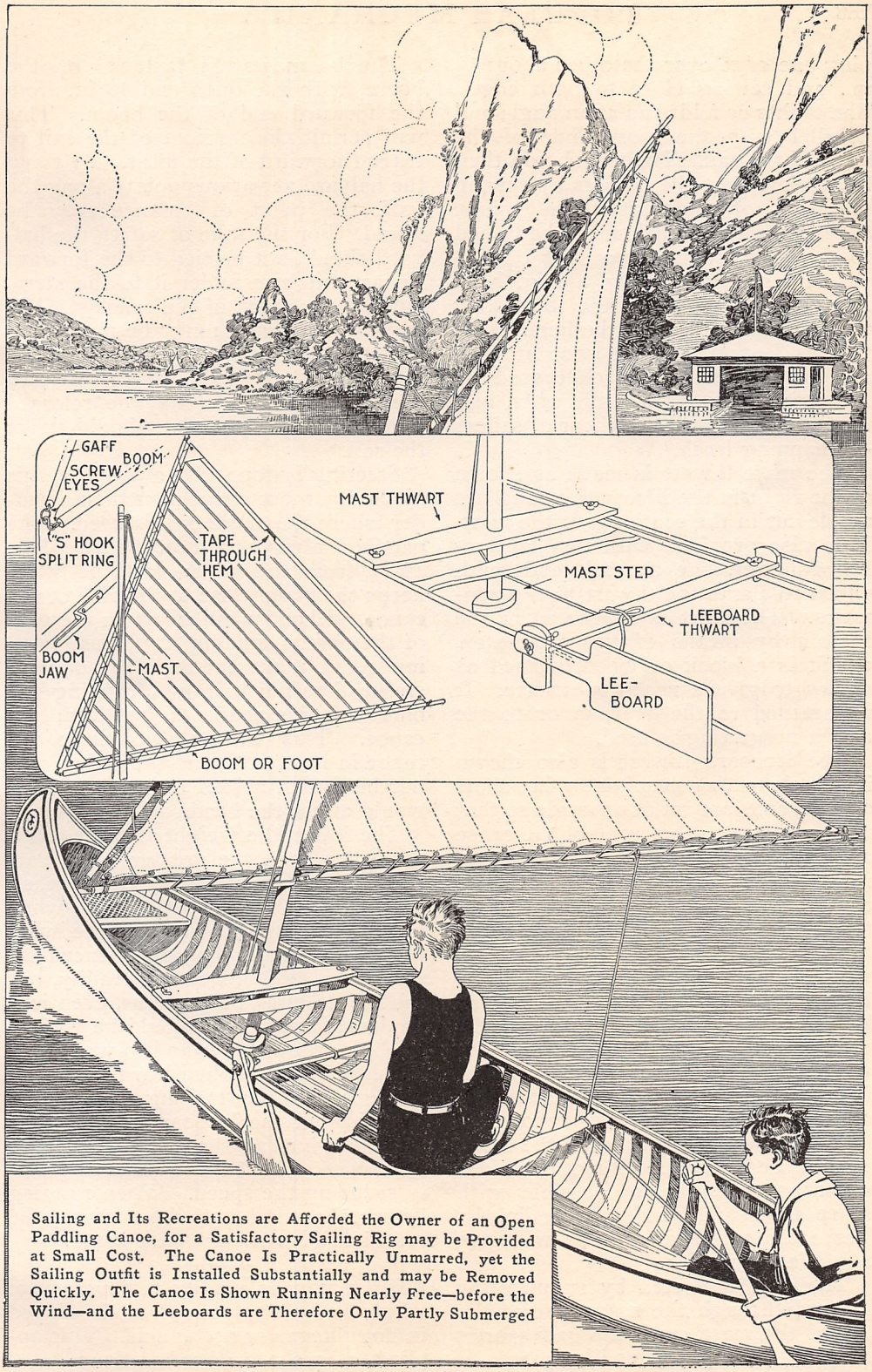
In converting the paddling canoe for sailing, it is desirable that it be unmarred, as far as possible. The rig described represents the result of experiments with various arrangements, and has been found to be safe and convenient. The original outfit has been in use for six years and will still serve for some time.

The lateen rig is best for an open canoe, because a shorter mast is required for the same sail area. An open craft is less suited for carrying sail than one which is decked fore, aft, and amidships. It is not safe to rig a canoe too heavily, and the rig described has been found to be well proportioned.

Bamboo is best for the mast, because it is lighter and tougher than a solid wood spar of the same dimensions, and is readily procured. Dealers in rugs use bamboo of 1½ to 2-in. diameter on which to roll carpets, and it may usually be purchased of them.

Cut the bamboo to a length of 6 ft. 10 in., and whittle a wooden plug, about 3 in. long, tapering it so that it will wedge firmly inside, taking care not to split the cane. Bore a small hole through the cane 2 in. from the top, plug it and fix a screw eye into the plug. Drive small brads through the cane into the plug to prevent the former from splitting. A brass ferrule fitted over the end of the bamboo will make a strong and neat finish.

The sail is made in the form of a triangle and measures 9 ft. on each side. It is best to have it sewed on a machine. The sail is bighted with parallel strips, or folds, ½ in. wide, spaced 6 in. apart, as shown at the left in the illustration. First cut the canvas to the approximate size and shape by laying the spars over it and marking the outline with a pencil. Next sew the separate widths together, lap-



Sailing and Its Recreations are Afforded the Owner of an Open Paddling Canoe, for a Satisfactory Sailing Rig may be Provided at Small Cost. The Canoe Is Practically Unmarred, yet the Sailing Outfit is Installed Substantially and may be Removed Quickly. The Canoe Is Shown Running Nearly Free—before the Wind—and the Leeboards are Therefore Only Partly Submerged

ping one edge over the other about ½ in., and sewing close to both edges. The bights or folds run at an angle and parallel with the loose ends of the leech of the sail. The sail should then be reinforced at the corners by sewing segments of cloth at these points. Along the edges which are to be lashed to the spars, fold over a strip of canvas and sew it to make a 1-in. hem. Run a ½-in. tape into the fold along the leech while sewing the hem. This tape is fastened to the spar at each end, to take up the slack caused by the stretching of the sail after use, thus preventing that bugbear of sailors —a flapping leech.

The mast thwart is made as shown at the right in the illustration, and has a hole cut in the center to fit the mast. It is also provided with two lantern-board hooks, one at each end, with which to clamp the thwart to the gunwales. The mast is supported at the bottom by means of the mast step, which is a block of wood, shaped as shown to give a neat appearance. It is fastened to the grating, or to the ribs if no grating is used.

The leeboard thwart is also shown in the sketch, at the right. The short upright ends are set at an angle so that they conform to the curve of the canoe and wedge the thwart into place immediately aft of the mast. The ends are grooved to fit the thwart and fastened with screws. A carriage bolt is fitted through each end piece and provided with a wing nut, which holds the leeboard in place on each side. The leeboards may thus be adjusted at the desired angle by fixing them with wing nuts. No dimensions are given, for it is obvious that they will vary on different styles and sizes of canoes. A finish in keeping with that of the canoe should be applied. Smooth all the work as carefully as possible with sharp tools and sandpaper it lightly. Three coats of spar varnish will give a satisfactory finish.

The sail is hoisted by running the halyard through the screw eye at the top of the mast, until the gaff spar is close to the mast top, as illustrated.

The boom jaw is fastened on the boom, with the open end 18 in. from the forward end of the boom. This will permit the forefoot of the sail to extend forward of the mast. By tying the halyard at various points along the gaff, the point of balance may be found. For the sake of safety the halyard should not be tied to the forward thwart, but run under it to the stern, within easy reach of the canoeist. The main sheet should never be made fast, but the rope merely looped around the thwart and held in the hand or beneath the foot, so that it may be released quickly if a puff of wind should strike the sail.

Steering is done with a paddle. This method is more convenient than a rudder where the single sail is used. The paddle is always used on the lee side—away from the wind—and the wake keeps the blade close to the side of the canoe, without much effort on the part of the person guiding it. When turning about make the regular paddling stroke, but finish it by thrusting the blade of the paddle away from the canoe. This will tend to keep the canoe in its course, and the paddle will not be drawn across the wake, which would affect the headway of the craft.

The lower the weight is placed in a canoe, or boat, the greater will be its stability. Hence, in sailing a canoe, sit on the floor of the craft, and when turning about, turn against the wind and not with it. The experienced canoeist can shift his course readily, but the novice must be cautious, even in a moderate breeze. It would be well to sail in shallow water and to wear only bathing costume when learning to sail a canoe. When tacking and sailing close-hauled the leeboard is the most effective, but as the boards are thin both may be kept down without greatly reducing the speed. When running before the wind both boards may be raised to give the greatest speed.

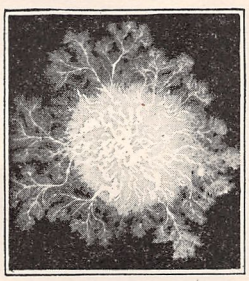
¶Paint may be readily removed from windows by applying a cloth dipped in hot vinegar or acetic acid. This applied to brushes will soften them.

Photographing Electric Sparks

Electric sparks may be photographed with simple equipment, and the process offers a diversion from the common subjects for photography. The materials necessary are a spark coil and current source, a photographic plate, facilities for developing it, and a sheet of tin foil. The illustration shows a typical photograph of an electric spark, and the variety possible is unlimited.

The process, which must be performed in a dark room with a ruby light, is as follows: Over the mouth of a small glass bottle, partly filled with talcum powder, tie a piece of cheesecloth, to act as a sieve. Arrange the material on a table, the sheet of tin foil lying flat, and a photographic plate on top of it, coated side upward.

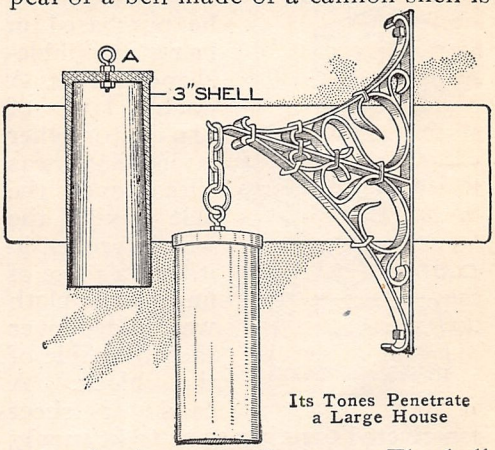
Spread a thin layer of the powder on the plate, through the sieve. Attach a needle to an electric wire and fix the other end of the wire to one of the secondary posts of the spark coil. Attach a second wire to the other post of the spark coil and to the sheet of tin foil. Care must be taken in handling the needle that only the insulated portion, where it is joined to the wire, comes in contact with the fingers, or a shock may result. Place the point of the needle near the middle of the plate and turn on the current, permitting it to produce a spark of not more than one second's duration. If the exposure is longer than that the result will not be satisfactory. Wipe off the powder and develop the plate. If care has been taken in the process, a photograph similar to the one shown in the illustration will result.



¶Shoulder hooks fixed about a shop, so that handsaws may be placed on them by the handle, will save damage to saws.

Cannon-Shell Dinner Bell

Being called to dinner by the stirring peal of a bell made of a cannon shell is



Its Tones Penetrate a Large House

a novelty in use in Toronto. The bell shown in the sketch was made of a 3-in. brass shell, and when struck with a gavel gives out tones that penetrate throughout a large house.

The cap piece was removed at A, and an eyebolt fastened in place with a nut on each side. The gong was suspended from a wall bracket made of a band of brass fastened to the wall.—Contributed by James B. Noble, Toronto, Canada.

Use for Old Magazines

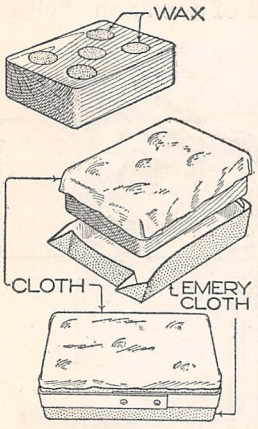
Magazines are often thrown away because of the rapidity with which they accumulate. Since most readers care to save only certain articles, a good plan is to tear the magazines apart, removing the desired articles and binding them in a separate volume. If this is carefully and systematically done, and an index prepared, the volume will be of value and interest.

Flatiron Polisher

Housewives, and others who appreciate the need for a smooth surface on a flatiron, will find the polisher shown in the sketch a convenient aid in keeping their irons in proper shape.

A wooden block, about 4 in. wide and 6 in. long, was fitted with five thin

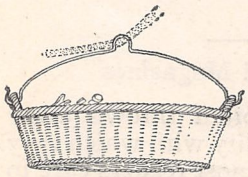
patches of beeswax as shown in the upper sketch. The holes bored into the wood were made large enough to fit the wax, which may be purchased in large thimble-shaped pieces. A double layer of linen, or other strong cloth, was fitted over the side having the wax imbedded in it, and a piece of fine emery cloth was folded over the other side of the block. A band of sheet iron riveted together so as to fit snugly over the edges holds the cloth and emery cloth in place.



The flatiron may be polished by rubbing it on the emery-cloth side of the block and waxed slightly by rubbing it over the cloth side.

Clothespin-Basket Hook

To conveniently support a clothespin basket along the line on which the clothes are being hung, a wire support can be provided, bent to form a hook at both ends and the center shaped into a V-bend. With the basket supported by the two ends, the wire can be slid along the clothesline as required.—Contributed by N. R. Moore, Cherokee, Iowa.



¶Varnishing should as a rule be done in a room having a temperature of 80° F., and in some instances 15° higher is desirable.

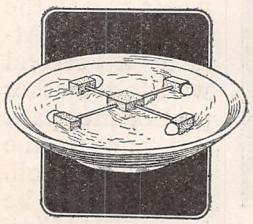
Leather Tire Patch

A leather patch fixed over a tire puncture with shellac will be found to give satisfaction and may be attached easily. Cut the patch somewhat larger than the puncture and thin out its edges with a knife. Melt flakes of shellac in a flame, fusing them, and rub the hot mixture on the patch and tire, smoothing it down quickly. Such a patch may be placed over a plug and will aid in holding it in place.—Contributed by Robert C. Knox, Petersburg, Fla.

A Perpetual Whirligig

Camphor is the motive power which drives the device shown in the illustration, and it will cause the whirligig to revolve for several days, or until the camphor is consumed.

The whirligig is made of a piece of cork, ½ in. square, with a needle stuck into each of its four sides. Smaller pieces of cork, to which pieces of camphor have been fixed by means of sealing wax, are attached to the ends of the needles. Care should be taken to keep the needles and cork free from oil or grease, as this will retard their movement. As soon as the device is placed in a dish of water it will start whirling and continue to do so as long as motive power is supplied. A small flag or other ornament may be attached to the center cork.



Testing and Caring for Files

To test a file hold it so that the light will be reflected sharply from the teeth and observe whether their edges are flattened and appear as white lines. If so, the file is dull and should be recut if of considerable size and value.

Files should not be thrown into drawers and mixed with other tools, but should be carefully set in racks or

drawers for the purpose. A mechanic would not throw a straightedge into a drawer containing other tools, and a file should be given similar consideration, as every nick in the teeth impairs the efficiency of the file.

Files may be sharpened by dipping them into sulphuric acid, but care must be taken not to permit the acid to come into contact with one's clothes or person. Water is used to wash off the acid.

Files should be provided with individual handles. This prevents injury to the hand of the worker and aids in the proper use of the file. Handles should be carefully fitted and be made of a size proportionate to the file. In removing a handle from a file, strike the handle at the end nearest the file, by sliding a piece of hard wood along the surface of the file, as the blow is struck with it. Do not use another file or metal object in thus removing a handle, as it will injure the latter.

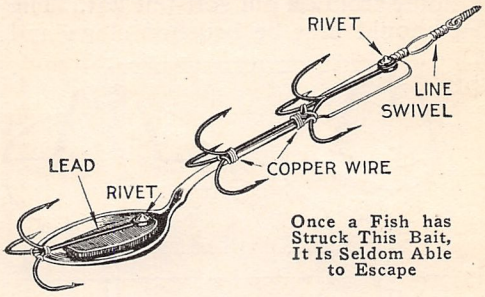
Catching Large Fish with a Teaspoon

Teaspoons may be made into alluring trolling spoon hooks, of a size suitable for catching large fish, by the addition of hooks, as shown in the sketch.

Drill ⅛-in. holes near the end of the spoon handle, the tip of the bowl, and near the handle of the latter.

Procure three sets of triple hooks, a line swivel, and a strip of lead, about 1 in. long. Rivet one end of the swivel and the loop of one of the triple hooks into the hole of the handle. Wire the lower end of this triple hook to the handle and with the same piece of copper wire secure a second triple hook at the thin part of the handle. Drill a hole through the lead strip and rivet it, together with a third triple hook, into the upper hole of the bowl. Fix the lower end of this hook by binding it with copper wire, through the hole near the tip of the bowl.

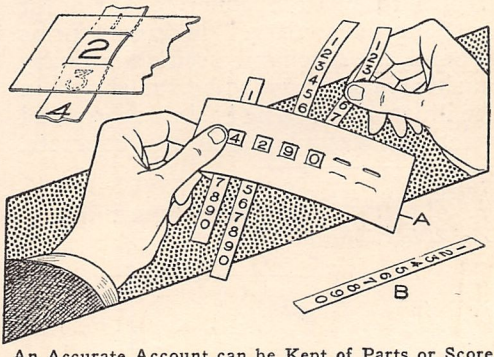
This hook has been tested in the waters of Puget Sound and is a deadly lure for rock cod, and other fish weighing up to 12 lb. The famous barracuda and rock bass of the Catalina Islands have also been caught with it. By permitting the lure to sink to the bottom and bringing it up a yard or two with a quick jerk, it acts as a "jig" bait. It may also be used in trolling. Once a fish has struck, it is seldom able to escape.—Contributed by O. P. Avery, Los Angeles, Cal.



Once a Fish has Struck This Bait, It Is Seldom Able to Escape

An Easily Made Counter

From unruled paper cut a piece, as shown at A in the sketch, and make slits parallel and evenly spaced with a sharp knife. Also cut six strips, similar to the one shown at B, to fit the slits cut in A. The strips are numbered as shown and inserted on the under side of A, and by pulling the strips as shown, one can count up the number of parts or keep tally on any game. By making more slits and using more strips very large numbers can be recorded.

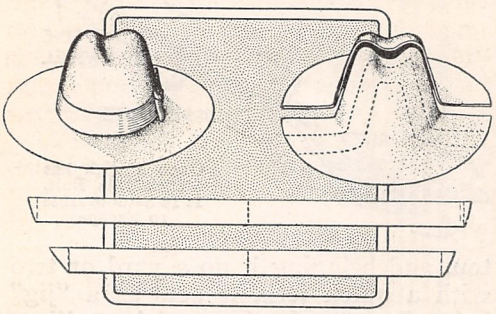


An Accurate Account can be Kept of Parts or Score for Any Game by Pulling the Strips

¶Be sure to keep the screw and nut in the jaws of a drill chuck clean and well oiled, to prevent broken screws.

Lamp Wicks Cheaply Made

Lamp wicks may be made cheaply at home from an old soft-felt hat. The hat should first be brushed clean and

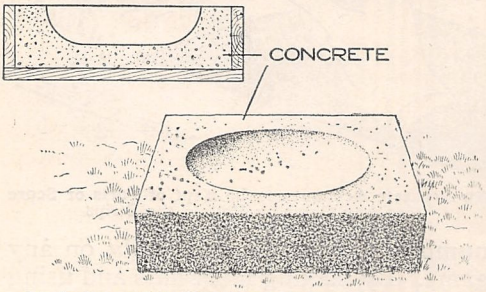


Cut the Hat into Halves and Then Cut It into Strips, from Which the Wicks are Made

the brim flattened by ironing it. The greatest number of wicks may be obtained if the hat is cut into halves with a pair of scissors, and then cut into strips of the required size, as shown in the sketch. Soak the strips in vinegar for two hours, dry them out of doors, if convenient, and they are ready for use. — Contributed by George H. Holden.

Concrete Water Basin for Poultry

A concrete worker was asked by a farmer to build a concrete basin for watering the poultry. Having no forms at hand, the mechanic used an ordinary washbasin and a wood box as shown in the illustration. The basin was greased before it was placed in the concrete.



An Ordinary Washbasin was Used to Shape the Depression in the Concrete

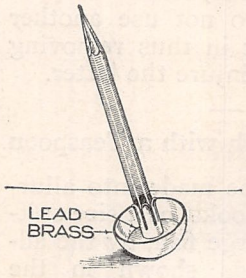
The completed concrete basin was buried with its upper surface level with the ground.—Contributed by James M. Kane, Doylestown, Pa.

Substitute for Ground Glass in Camera

The ground glass in my camera was broken while arranging to take a picture of a party one evening, and being unable to obtain another, I substituted a piece of white tissue paper drawn over a piece of plain glass. It did the work so well on that occasion that I have used it continuously since, and have found it better than the ground glass. It produces superior definition in the views on the glass, especially when working in a poor light, and is a good focusing screen.—Contributed by C. W. Smalley, Des Moines, Ia.

Pencil Holder for Workbench

Mechanics, and others who have occasion to use a pencil on a workbench,



will appreciate the pencil holder shown in the sketch. It was made by soldering the small brass ferrule into the bottom of a portion of a brass knob, and weighting the knob with lead. The pencil will be held in an upright position where it may be easily seen.—Contributed by R. F. Hoffman, Chicago.

Repairing Burned-Out Incandescent Globes

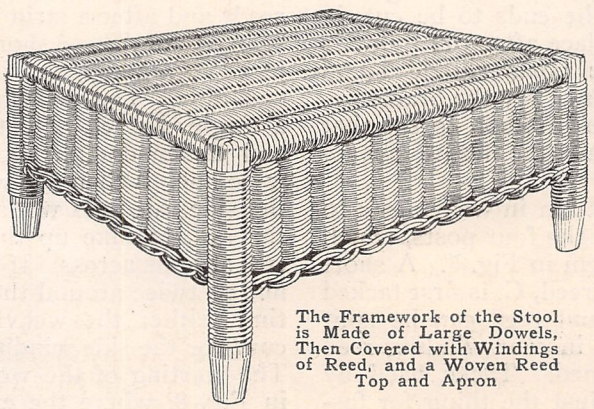
Incandescent electric bulbs that have been burned out may be repaired by shaking them, in order to cause the broken ends of the metal filament to strike together. By examining the broken filament one can determine in what direction to shake the globe. The sudden passage of the current upon contact causes an arc at the broken ends of the filament, welding them. A globe thus repaired should be placed in a socket where it will not be given undue disturbance and will then last for a considerable period.

A Woven-Reed Footstool

By CHARLES M. MILLER

[The various materials referred to in this article by number or size were described in detail in an article on "A Reed Basket," in the April, 1915, magazine, page 625.—Editor.]

REED furniture has become very popular within the last few years, and the newer designs and methods have been so attractive as to place this constructive effort among the handicraft series of modern art. It is possible so to analyze, simplify, and illustrate this work as to make it feasible for amateurs, and at the same time there are possibilities which involve problems that may try the ability of the skilled workman. In other words, there are possibilities of progress in this kind of furniture making. There are places where careful weaving is the principal aim; again particular attention will be given to corners, or, perhaps, a nicety of modeling will be found necessary to bring out the proper curves involved.



The Framework of the Stool is Made of Large Dowels, Then Covered with Windings of Reed, and a Woven Reed Top and Apron

Each piece of reed furniture has a framework, usually of dowels, but it may also be made of boards in such models as small tables, dressers, bedsteads, chests, etc. The board construction is more often covered with flat reed. In footstools there are both kinds of framework. The illustrations show the same parts marked with the same letters throughout the series of sketches.

The framework of the stool is shown in Fig. 1, in which the rails and posts are made of dowels, ¾ in. in diameter, and the braces of dowels, ⅝ in. in diameter. It will be noticed that the posts extend to the top of the frame for strength in this manner of construction. If the rails rested on top of the post S, the nails would have to be driven into the end grain of the wood, which makes the strength depend entirely on the holding power of the nail in this position, as there is no binding of the upper part to the posts in the weaving. With the post extending to the top, the nail passes through the upper part of the post and into the end grain of the rails, and the rails are bound together horizontally by the weaving.

The material for the frame consists of the following dowel stock: two pieces for rails, ¾ in. by 14 in. long; two pieces for rails, ¾ in. by 9 in. long; four posts, ¾ in. by 7 in. long, and two braces, ⅝ in. by 17 in. long. These pieces are shown in Fig. 2. If notches are cut with a small saw, a coping saw preferred, in the ends of each rail and in the braces, as shown in Fig. 3, they will fit to the posts better and make a stronger joint. While different makers use a finishing nail; a barbed or corrugated, nail; or a cemented, or glue-coated, nail, I find the best to be an ordinary 4-penny nail, which answers the purpose well. Do not drive the nail through the posts without first drilling a hole with a 1/16-in. drill. A small hand or breast drill will be needed for this work.

Before nailing the frame together, the holes for the spokes in weaving should be drilled in the rails. The spokes may be No. 4 and the weavers No. 3 reed. The No. 4 reed requires a ⅛-in. hole. The hole for the top and end side spokes may be combined, as shown in Fig. 4. The dotted lines show the vertical and horizontal diameters, and E the outside and F the inside of the rail, one hole being represented as sawed in two. The spokes

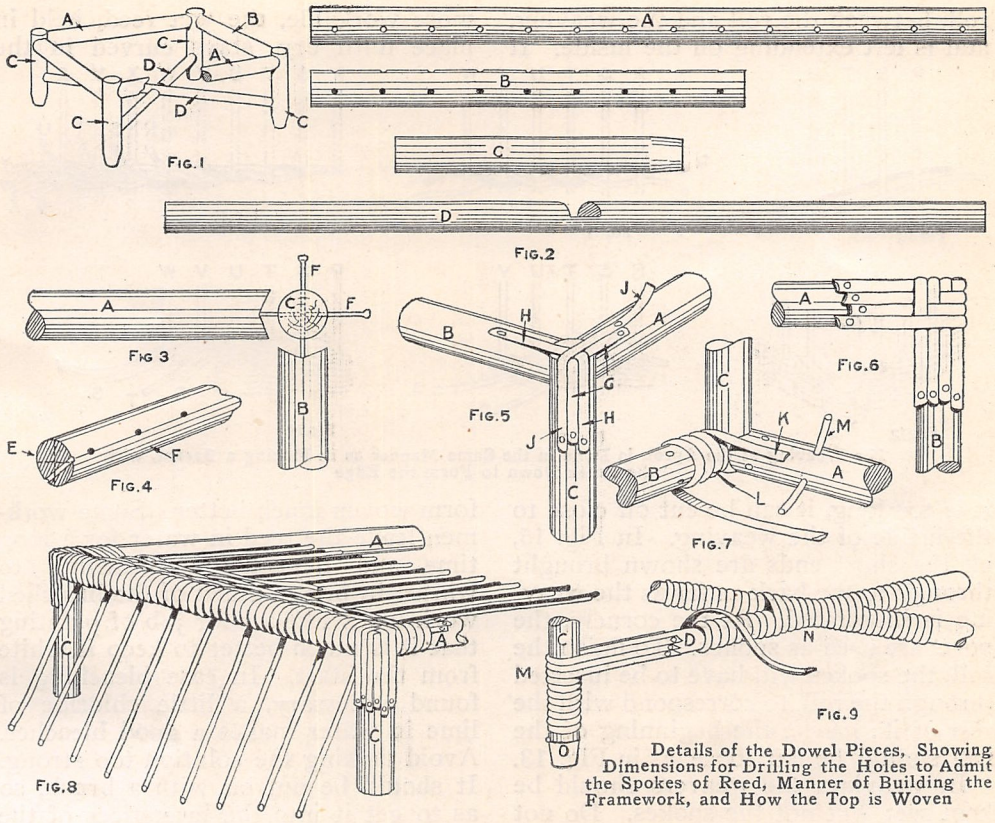
for the top extend down and out at the ends, and each may be of one piece, 32 in. long. As there are no spokes at the top extending to the side pieces, short spokes must be inserted at the right time for the side weaving. The location of the holes in the side rails is shown in Fig. 2. The holes in the side rails may be drilled straight in the wood.

The pieces may now be nailed together to form the frame, as shown in Fig. 1. If the top of the side rails A are set about 1/16 in. below the tops of the posts, the weaving will be almost level, as the winding reed is thinner than the round reed. The braces D are halved at the center, on a slant, to bring their upper surfaces on a level when they are in place. The length of 17 in., as given in the material list, is not accurate, as sufficient length is given to allow the ends to be cut, in fitting them in place after the frame is assembled. The posts should stand vertical and square. Try the braces before nailing them in place, to see that they do not draw the frame out of shape.

The first operation in weaving is to cover the tops of the four posts, which is started as shown in Fig. 5. A short piece of winding reed, G, is first tacked in place. A round reed can be split if one is careful, in case winding reed cannot be obtained. Tacks used by shoemakers are just the thing for fastening these weavings in place. After fastening the weaving G in place, another, H, is put on in an opposite direction, whereupon J is fastened on the same as G, and so on, until the post is covered, as shown in Fig. 6. Perhaps a better way to cover the posts would be to tack all eight pieces on the post part C, and then weave them down together. It may not be necessary to tack them all on the rails.

After the corners are all covered, the end rails B are wound with the winding reed, the start being shown in Fig. 7, where the frame is shown in an inverted position. The reed is tacked, at K, to the side rail, and whenever the winding comes to a hole, a pencil mark is made to locate the hole later. This mark is shown at L. When the two end rails are wound, push a bodkin, or other steel point, in between the windings where the marks are located, to make way for the insertion of the spokes. It may appear to an observer that the spokes could be put in before the winding, but the winding cannot be properly done after the spokes have been inserted, as the windings would separate too much around them. The hole must be opened up through to the opposite side of the rail. Single spokes go through the rail, and they are only put through one end rail at first, as the weaving is much easier with one end of the spokes free, but, of course, they must be inserted in the other end before the weaving gets within 2 or 3 in. of that end. An extra spoke is inserted beside each spoke, as the weaving proceeds and after a strip has been woven 3/4 in. wide. These short spokes are cut just long enough to fit in between the end rails. The weaving is done with a single weaver, and it is passed over and under double spokes as if they were one. When the weaver comes to the side rail, it is wound twice around the rail, to take up the space for the two strands across. If the weaver does not go twice around the side rails each time, either the weaving will take a curve or the side winding will be loose. The starting of the weaving is shown in Fig. 8, where the extra spokes are inserted along the side of each spoke that runs through the end rails.

After the spokes have been inserted in the opposite end rail and the weaving in the top completed, the braces and posts should be wound. Where the braces D connect to the posts C, three strips of the winding reed are passed around the post and tacked on both sides of the braces, as shown at M, Fig. 9. Where the braces cross, the winding passes around both pieces for a short distance, as shown at N. It is quite appropriate to use the brass caps O on this model, but on many stools their use has been discontinued and the winding continues down to within 1/8 in. of the bottom of the post.



Details of the Dowel Pieces, Showing Dimensions for Drilling the Holes to Admit the Spokes of Reed, Manner of Building the Framework, and How the Top is Woven

In case the brass cap cannot be obtained, the winding may be used also on this model.

The side weaving is called the apron, and in this case the pairing weave is used. The short spokes will have to be inserted in the under side of the side rails, and the extra spokes are added after the weaving is started and a small strip woven. The pairing weave is shown in Figs. 10, 11, and 12. The two weavers are represented by the letters P and Q. The weaver P passes back of spoke T and out between T and U. The weaver Q is then used in the same manner, and so on, around the stool. When the post is approached the weaver that comes out between the last spoke and the post is passed around the post and in behind the next spoke on the other side. It will be seen in the pairing weave that the weaver behind is always thrown over the other weaver. This gives the appearance of a rope twist to the weaving, and also cinches it to the spokes and prevents slipping. Always pass the one weaver around the post twice to take up the space for the one that cuts across the corner. The weaving of the sides or apron is done with the object turned upside down, where it is in a good position for finishing off, which is sometimes called breaking down.

If the weaving has been carried far enough, the extra spokes are cut off even with the weaving, and the breaking down may be done as follows: The spoke R, Fig. 13, is shown turned down back of the spoke S, and S back of T and out. The spoke R, as shown in Fig. 14, is back of S, in front of T, back of U, and out between U and V, but as R is brought out, the spoke T is brought down back and parallel with R. Likewise the spoke S passes back of V, and U is brought down with it. The spoke T is brought back of W and V is brought down back of it. The short end of R is inserted under the

roll, between the roll and the weaving, and is left extending on the inside. If it is too long, it can be cut off close to the inside of the weaving. In Fig. 15, all the short ends are shown brought through to the back as far as the weaving is illustrated. At the corners, the posts are used as spokes. To finish the roll, the spokes will have to be inserted through the roll, to correspond with the rest of it; hence, the beginning of the roll should be left loose, as in Fig. 13.

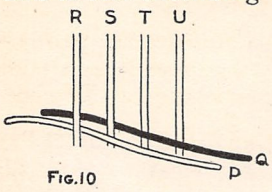


FIG. 10

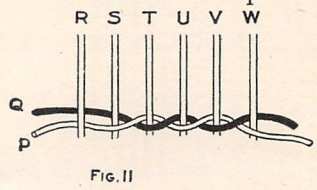


FIG. 11

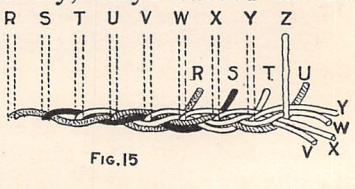


FIG. 15

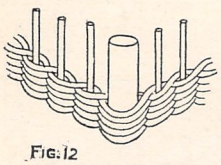


FIG. 12

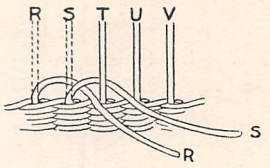


FIG. 13

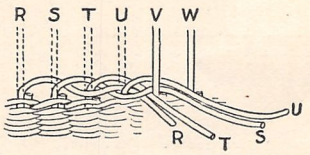


FIG. 14

The Weaving of the Apron is Done in the Same Manner as in Making a Basket, with the Break Down to Form the Edge

In weaving, the weavers should be kept wet, but not the spokes. Do not put the reed in water and leave it for any length of time, as it will become discolored. About 15 minutes will be sufficient to make the reed pliable, then it is best to have a sponge and bucket of water at hand, to dampen long weavers frequently by drawing the reed across the wet sponge. Besides being more workable, the wet reed, held in place until dry, stays curved in the form woven much better. Some workmen leave the reed in water for a long time and depend on bleaching to whiten it, but so much of the bleached work looks like a poor job of painting that it is much better to keep it white from the start. In case bleaching is found necessary, a little chloride of lime in water makes a good bleacher. Avoid making the solution too strong. It should be put on with a brush, so as to get it into the interstices of the weaving, whereupon the work is placed in the sunshine to dry.

Any kind of reed used will have some of the small hairlike fibers sticking out after the weaving is complete, and this should be singed off with a gas flame. A blowtorch is good for this purpose. Be careful not to scorch the weaving.

A Homemade Ellipsograph

BY J. A. SHELLY

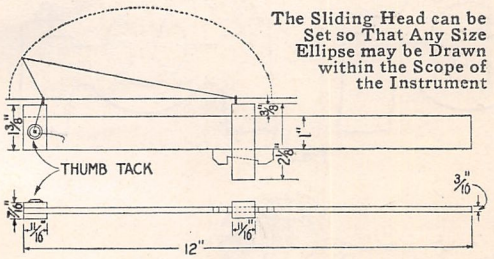
The instrument illustrated was designed to take the place of the two nails and a piece of string for drawing ellipses of different sizes. It is made of hard wood, preferably maple or beech, and consists of a bar with one fixed and one sliding head, the latter having a wedge clamp to hold it at any point desired on the bar.

In the ends of the heads are driven two coarse needles that have been broken off about 5/8 in. from the eye end. These ends should be placed 1/8 in. from the inside of each head and the same distance from the bottom, and driven in until the eyes are each 1/8 in. from the surface. A piece of linen thread is run through the eye of the needle that is in the end of the sliding head and knotted to prevent its pulling out, and the free end is run through the needle eye on the fixed head. The thumb tack in the fixed head is to secure the free end of the thread. The

tack is driven in at an angle so that one edge sticks up enough to allow the thread to be pulled under it.

To operate the ellipsograph lay out the length of the major axis on a center line, then bisect the distance between these points and erect a perpendicular. On this line lay off half the minor axis, measuring from the center line; then from this point locate the foci by setting the dividers to half the major axis and scribing arcs of circles to cut the center line. Set the heads of the instrument so that the projecting needle ends will be the same distance apart as the foci, and clamp the sliding head with the wedge. Set the instrument so that the needle eyes will be exactly over the points where the foci are on the center line. A pencil, with a little groove filed 1/8 in. from the point, for the thread to run in, is set to half the minor axis and the thread is pulled taut and secured by the thumb tack. The pencil should be held perfectly perpendicular while scribing the line. The instrument must be reversed to draw the other half of the ellipse.

To draw an ellipse that will be an exact projection of a circle at any given

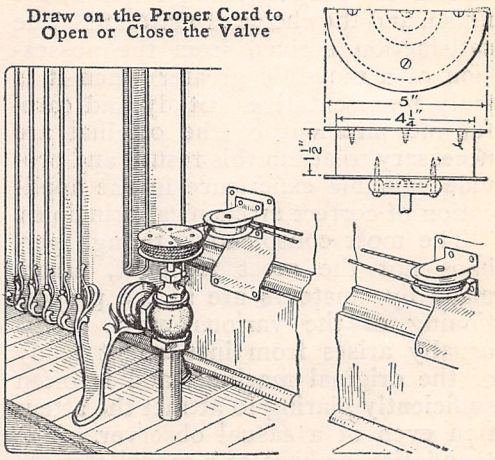


angle it is necessary to determine the length of the major axis. This may be done by laying out the circle, either full size or to scale, and projecting two parallel lines equal to the diameter of the circle, or its scale, and connecting these lines with a line drawn to the required angle. The length of this line is the major axis.

¶Never run a glass cutter over the same line twice, as this will ruin the cutter. Alcohol rubbed along the line to be cut aids in the process.

Ship's-Wheel Device for a Radiator Valve

Leaving one's comfortable bed to open the valve of a radiator in a cold room is an unpleasant task. The de-



vice shown in the sketch obviates the necessity for leaving the bed, yet gives as positive control over the valve as if the hand were on the valve wheel.

The construction of the pulley attached to the top of the valve wheel is shown in the small sketch at the right. It is built up of a center section of wood and flanges of sheet metal, fastened with screws. The pulleys attached to the wall are built in the same way, but are smaller. Any size that is convenient may be used for the larger as well as the smaller pulleys, but the larger pulley must be small enough so that it will not rub against the end of the radiator.

The cord is wound around the pulley at the valve handle, several times, like the steering cord on a motorboat. This gives a positive grip on the pulley. The cord may be conducted directly from the large pulley to the nearer small pulley, the other small one being omitted.

To operate the device draw on the proper cord to open and close the valve. It would be well to mark the cords with tabs so that they may be readily distinguished.—Contributed by P. D. Norton, Chicago, Ill.

Common Mistakes in Model Making

By H. J. GRAY

MODELS made as a pastime or for exhibition purposes should represent correctly the full-sized machine, not only as regards general design but also in the proportioning of parts, the finish, and the choice of materials. The satisfaction derived from the possession of a model is greater when it is truly representative. Study and careful measurement of the original are necessary to attain this result, and provide valuable experience in the application of correct mechanical principles.

The most conspicuous, though perhaps not the most frequent, errors made by amateurs are in the proportioning of the various parts. This usually arises from insufficient study of the original machine, and is often sufficiently glaring to attract the attention even of a casual observer. The foundation or base of a model stationary engine, for example, is often painted to resemble brickwork. This is correct, provided the spaces are proportioned so as to represent bricks and not three-ton slabs of granite.

Mistakes are made in the selection of pulley wheels, both as regards the character and the size of the pulley that would be suitable for the particular purpose.

The "cheese-head" or flat-head machine screw appears to have a peculiar fascination for the model maker, judging from the frequency with which it is misplaced. It is only necessary to consider what would happen in a full-sized machine if such screws were used for making joints in valve rods, cylinder covers, slide bars, for fixing bearing caps, and the like, to realize how completely such a defect mars the appearance of a model to a discriminating eye. Bolts, or, in some cases, studs and nuts, should be used to give an appearance of correct workmanship.

Many novices make a serious mistake in the character of the finish given to the various parts. This usually results through devoting insufficient attention to the method of manufacture adopted in engineering practice. Under the impression that a mottled appearance gives an ornamental effect, they will make a shaft end with a

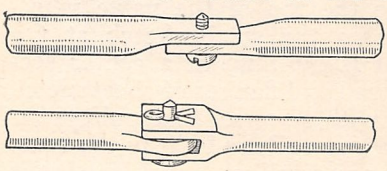


FIG. 1

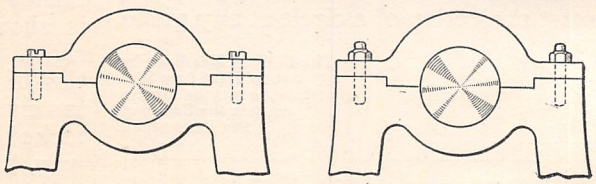
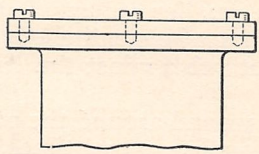


FIG. 3



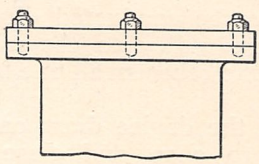


FIG. 2

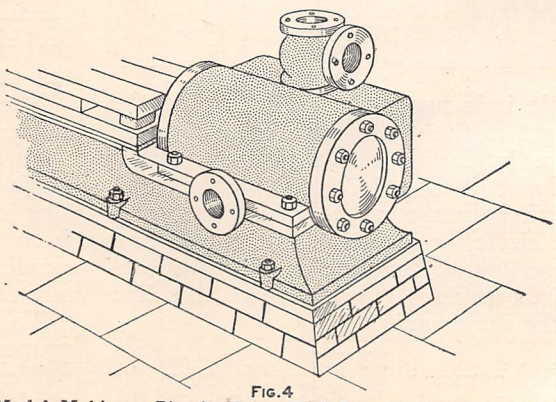


FIG. 4

Details of Correct and Incorrect Practice in Model Making: Fig. 1, Valve Rod Joined by "Cheese-Head" Screws, Wrong, and Joined by Joint and Pin; Fig. 2, Bearing Cap Fixed with Flat-Head Machine Screws, Wrong, and with Studs and Nuts; Fig. 3, Cylinder Cover Fixed with Flat-Head Machine Screws, Wrong, and with Studs and Nuts; Fig. 4, Representation of a Brick Foundation, Incorrectly on Side, and Correctly on End

scraped finish. To the casual observer there would be nothing amiss, but a mistake of this kind would offend the trained eye of an engineer, because it is entirely unrepresentative. The object of scraping sliding surfaces is to obtain a greater degree of flatness by removing small inequalities. As the subsequent use of a file would only undo the work of a scraper, the surface is permitted to remain mottled, as left by the scraping tool. But the end of an engine shaft is not a sliding surface, and in engineering practice would be finished in a lathe.

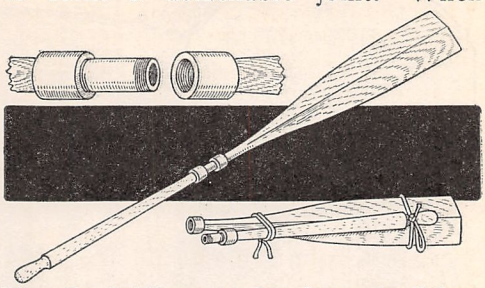
Nickelplating is often resorted to in order to produce a brilliant and supposedly pleasing finish to the model of a casting. This is obviously wrong, for the actual casting—which might weigh tons—would be painted, and not electroplated.

Locomotive wheels or stacks of polished brass add to the appearance of a model only in the eyes of the uninitiated. Few persons would care to risk a railroad journey if the engine had brass wheels. Iron or steel is the correct material to use. Brass is also often used instead of iron for cylinders, connecting rods, and starting levers on models, or for steam pipes, which should be made of steel or copper.

In certain cases there may be unusual difficulties in using the correct material for a machine part made to a small scale. It is then permissible to use other material, provided some attempt is made to disguise the fact by means of an appropriate finish. Copperplating, for example, may be used to disguise some other material, if the parts should properly be made of copper. It is often convenient to make a model boiler of brass. It should not be polished but bronzed, to represent the iron or steel plates of a full-size boiler.

Take-Down Emergency Oars

Owners of sail or power boats will find the take-down oars shown in the sketch easily made and of value in an emergency far out of proportion to the space occupied in a boat. A pair of ordinary oars was cut as shown, and pipe fittings were attached to the ends to form a detachable joint. When



When Knocked Down the Oars Occupy Small Space in a Boat

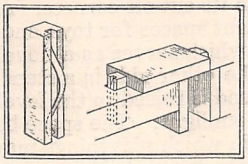
knocked down the oars may be stored in a seat cupboard, or other convenient place.—Contributed by H. E. Ward, Kent, Wash.

How to Make Propeller Blades Quickly

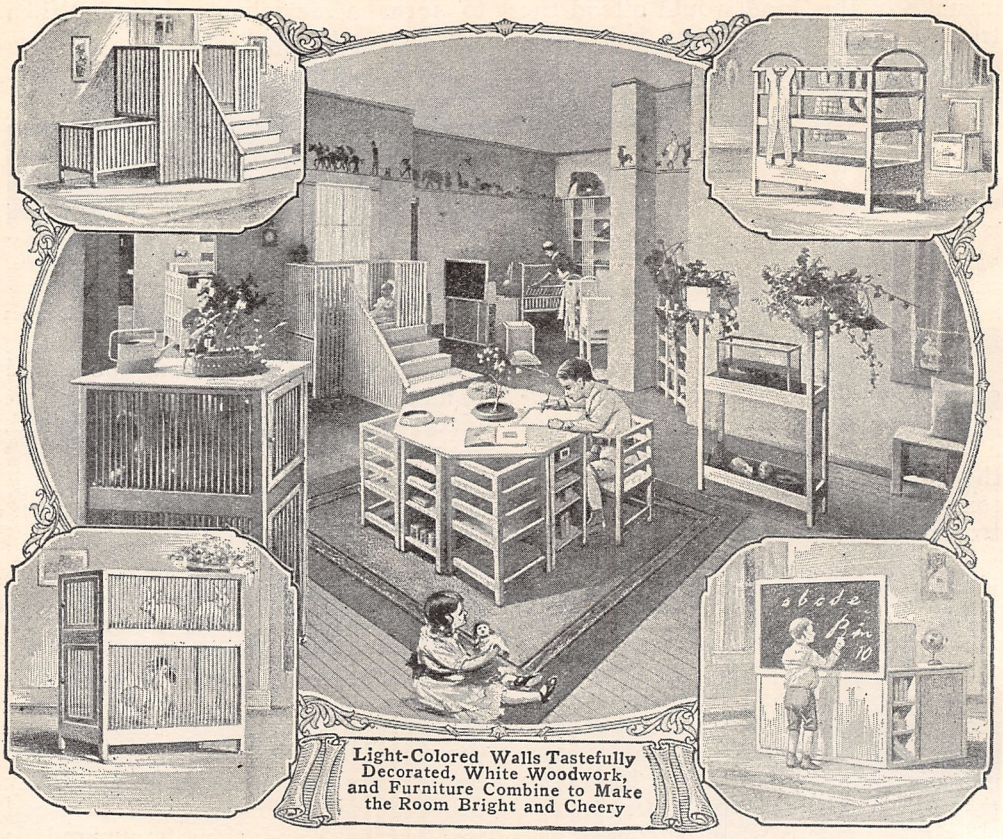
Requiring a number of propeller blades for use in making models of windmills, and other constructions, I found that I could save much time and obtain a satisfactory set of propeller blades by using ordinary shoehorns of the same size. The small ends of the horns were flattened out so that they could be fastened to pieces of wood for bearings, and then hammered to the proper shape for cutting the air, or receiving the force of the wind.

Bench Stop

Serviceable bench stops may be made by grooving pieces of maple, or other close-grained, hard wood and fitting strips of clock spring into them, as shown in the sketch. The pieces must fit the holes in the bench top snugly, and the spring will then prevent them from slipping out. The end of the spring fastened to the stop should be annealed so that a hole for the screw may be drilled into it readily.—Contributed by Stanley Mythaler, Spring Valley, Minn.



COZY NURSERY OUTFITTED IN PRACTICAL WAY



Light-Colored Walls Tastefully Decorated, White Woodwork, and Furniture Combine to Make the Room Bright and Cheery

PHOTO BY CARDINELL VINCENT, COPYRIGHT BY PANAMA-PACIFIC INTERNATIONAL EXPOSITION

BECAUSE of its cheery appearance and unusual convenience of arrangement, the nursery illustrated herewith presents a number of pleasing and practical suggestions to the householder. Everything, from the decorations to the appointments, merges to produce a desirable atmosphere. The nursery may justly be called the most important room in a home, and here is one in which simplicity, durability, and harmony are afforded without needless extravagance. The furniture, all of which is finished in white enamel, combines the features of service, propriety, and ingenuity. The octagonal table used in the middle of the room has four box-shaped chairs which fit beneath its cut-off corners. A series of small shelves are also provided on four sides and offer convenient spaces for toys and books. At the left is a barred hutch, made in the form of a cabinet, which serves as a novel depository for stuffed animals when the latter are not in use. On the other side is a stand supporting flower boxes and an aquarium. The gallery in the background is raised to the level of a window and provides a cozy place where a baby can bask in the sunlight. The space beneath it is used to receive a crib, while the steps are in reality drawers in which playthings may be kept in order. At the back of the room is a desk with shelves at the top and sides and a blackboard hinged to the back, while near it is a rack on which all of the little clothes may be hung at night. Cribs, shelves and racks for toys, and other fittings occupy the alcove.

IN accordance with the editorial policy of this magazine never to accept compensation in any form for what appears in our reading pages, and also to avoid all appearance of doing so, we are obliged to omit the name of the maker or the seller of any article described. This information, however, is kept on file and will be furnished free, by addressing Bureau of Information, Popular Mechanics Magazine, Chicago. [Editor.]

A New Aladdin

$828

7 Room Modern Aladdin Home

Highest AWARDS WORLD'S FAIR

Here's a new home fresh from the Aladdin designing rooms. It was completed too late for classification in this year's catalog. This new Aladdin was designed to meet the needs of the average American family. Just right in size for the average city lot. Has a delightful porch, generous living room, lovely dining room, an efficiency kitchen, inside cellar entrance, three fine bedrooms, bath room and closets. To really appreciate this wonderful new home design you must see the plan or room arrangement. The Aladdin price on this design saves you from $300.00 to $400.00 over the lumber dealer's price. First, other lumber manufacturers have raised their prices from $4.00 to $10.00 per thousand this year. Aladdin prices remain unchanged. Second, Aladdin houses save waste of lumber—all material cut to fit.

Aladdin System Cuts Out Waste

The Aladdin Readi-Cut System designs houses to use mill run lengths of lumber—just as it comes from the forest—and your carpenter does not need to waste any material by cutting during the erection of your house. Waste of lumber is here reduced to 2%—you pay only for what is used and **no more.** You can build your Aladdin yourself—complete instructions and illustrations show you how to build it and save big money.

Bungalows, Dwellings, Summer Cottages

Buy direct from the forest—from Aladdin—and make four savings. You make a substantial saving on the lumber, on the millwork, on the hardware and on the labor. The big Aladdin catalog tells all the facts you want to know, gives photographs, floor plans, prices and descriptions of a hundred modern homes, Bungalows, Dwellings, Summer Cottages and Garages. Send for it today.

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North American Construction Co.

5-Room Home $298

Price Includes All Materials

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The New Arrows *Ashby* 2⅛ in — *Lexicon* 2½ in —

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Because the Arrow fabric is extraordinarily fine, smooth and durable, the domestic satin laundry finish is possible. The satin finish marks the difference between the ordinary and the *high quality* 2 for 25¢ collar, and is the Arrow's distinguishing mark of quality.

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They tested Blue Streaks in every possible way — and proved to their own satisfaction that Blue Streaks gave the best service and the longest mileage at the lowest cost to the rider.

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Big and hardy, good-looking and easy riding, safe and sure, no other tire is so well fitted to give unusual mileage, to lessen trouble, to increase speed and save power.

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Any motorcycle dealer can sell you Blue Streaks. Ask for them.

The Goodyear Tire & Rubber Co.
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GOODYEAR
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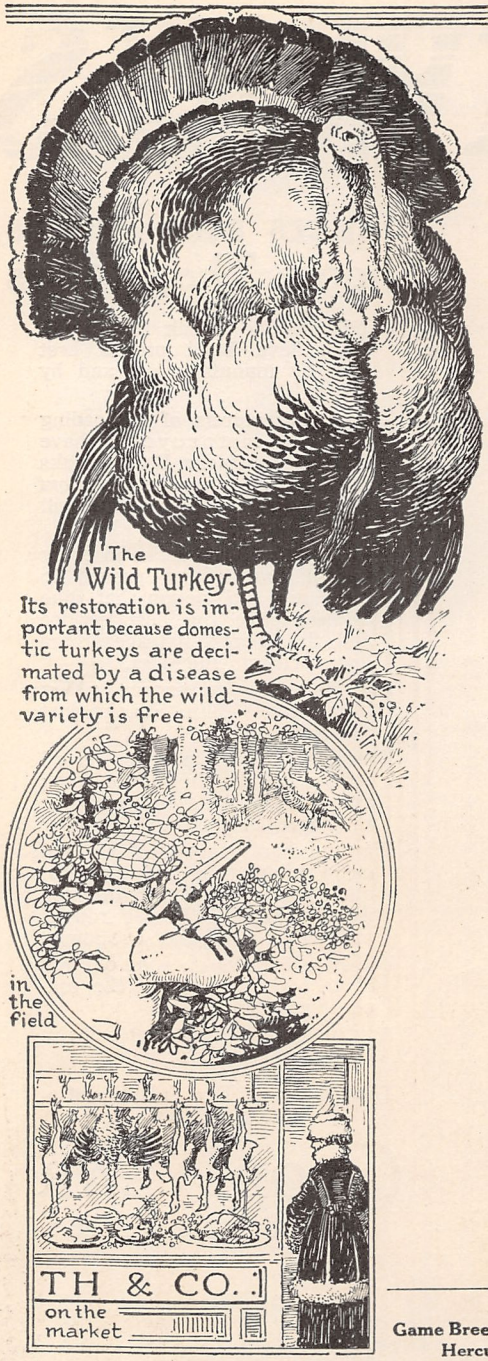
Motorcycle Tires

Please Mention Popular Mechanics



When Our Land Is Filled With Game

A FEW years ago America was the greatest game country in the world. Our woods, our fields, our water-ways, were teeming with game birds. Wild turkeys, quail, grouse, ducks, were familiar sights—to the sportsman; on the table; and in city markets.

These conditions should again prevail. They may successfully be brought about through game farming.

Game farming does not necessarily require a large amount of land and involves little expense in time and money. The work in itself is intensely interesting and affords both profit and pleasure to those who indulge in it.

Results from Game Farming

In the first place game birds of many kinds command high prices in city markets. Their eggs are eagerly sought by breeders. Secondly, if you are fond of hunting, the birds you raise will provide excellent sport and food. Or if you prefer, and if you own large acreage, you may lease the privilege of shooting over your land. This does not mean that the sport of hunting, so far as the general public is concerned, will be restricted. On the contrary it will be increased; for game raised for sporting purposes cannot be closely confined in any given area.

If you are interested in game farming from any standpoint, you should write for a booklet which takes up the subject in a broad way and gives much interesting and valuable information regarding it.

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Shave-consciousness and self-consciousness—

Both are bad business, and especially bad in business.

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You can't have your mind on face matters and fiscal matters at the same time. Efficiency flees; concentration takes a hop, skip, and a jump to parts unknown.

Mennen's Shaving Cream has kept millions of faces from being shave-conscious by the soothing healing of its scientific and incomparable lather.

Mennen's absorbs water like a sponge and remains moist for about ten minutes. No need of frequent re-lathering or "rubbing in."

It is without those torturing little stilettos of free caustic that lurk in other shaving soaps and make shaving a torture.

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Mennen's energizes the "once-over" into twice its ordinary efficiency. It rejuvenates many a discarded razor-blade.

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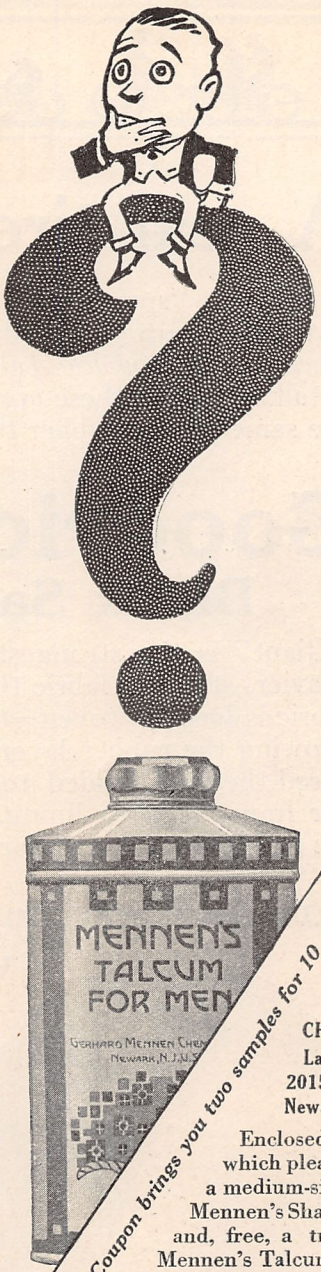

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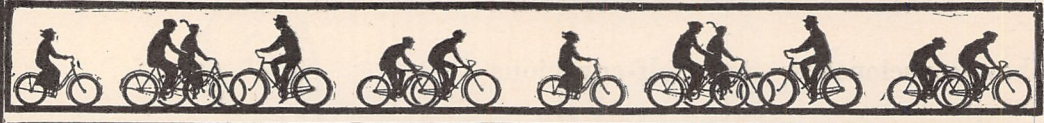

A real tire for a real boy!

It lets you "speed 'er up" with safety, for its "safety bars" dig down and grip the road preventing slips, just as your father's *black tread Goodrich Auto Tires do.* Everybody in the country is talking about these *big "Black" Auto Tires,* and we have put the same gristly rubber tread on the "Giant" *for your bicycle.*

Goodrich "GIANT"

Black Safety Tread Tire

"Giant" is the strongest Bicycle Tire ever made with actually heavier, stronger fabric than many small sized Auto Tires. This fabric is loosely woven—different from any other bicycle fabric—allowing the rubber layer to sink through its mesh so that when cured they are welded together into a single piece of solid rubber from tread to lining. Although it costs a trifle more, they are guaranteed for a year and will outlast several ordinary tires.

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FIRST—A Goodrich "Boy's Guide Book" telling how to make a boomerang, how to build a camping tent, how to signal by semaphore, and many other "pointers."

SECOND—A rich Maroon or Blue Felt Pennant with Sparkling Frosted Letters.

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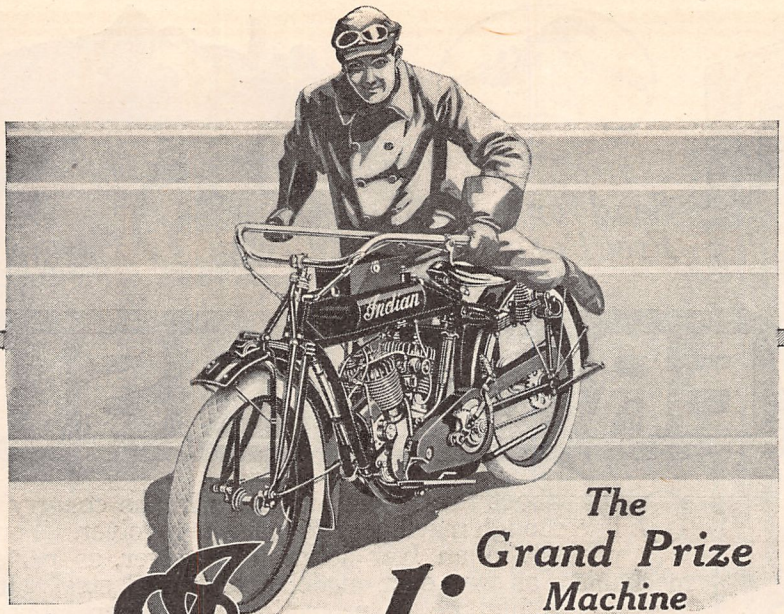


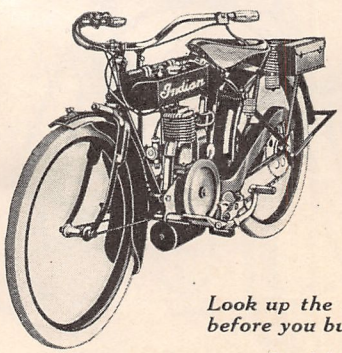
The Grand Prize Machine

Indian

THE only Grand Prize awarded a motorcycle at the Panama-Pacific Exposition was given to Indian.

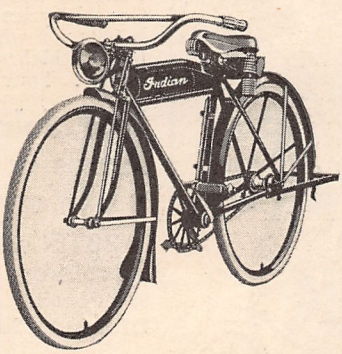
Two months ago a 1916 Indian with Powerplus Motor covered 1000 miles in 21 hours and 3 minutes—a world's record. These are the big kind of honors that Indian is always earning for itself.

This year the name Indian means more to the purchaser than ever before because he can have a $275 Big Twin, a $150 Featherweight or a moderate priced Bicycle, all bearing the Indian nameplate.



At the left—1916 Indian Featherweight—2½ horse power, 3 speed, Indian Starter—Indian Cantilever Comfort Saddle—$150.

At the right—Indian Motobike—little brother of the Big Indian Motocycle and built along the same style lines. Electrically equipped. Price $40. 10 other models, $25 to $40.

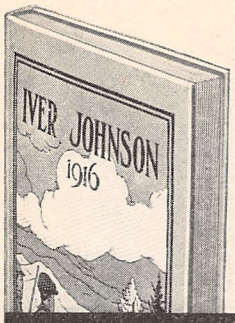


Look up the Indian Dealer in your city before you buy anything on two wheels.

Send for Motorcycle or Bicycle Catalogue

Hendee Manufacturing Co., 711 State St., Springfield, Mass.

(Largest Manufacturers of Motorcycles in the World)



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IVER JOHNSON

ONLY about three machine shops in the country have fine enough machinery to make a revolver. You can possess, in an Iver Johnson Revolver, as perfect a mechanism as was ever made of tempered steel. It will give you a lifetime of protection. An Iver Johnson is safe because accidental discharge is absolutely impossible. You can Hammer the Hammer.

This same wonderful quality of machine workmanship produces the Iver Johnson Bicycle. Which explains why, since bicycles were first invented, the Iver Johnson has led. There is no more comparison between an Iver Johnson Bicycle and an ordinary bicycle than between a fine watch and an alarm clock. This superiority shows in speed and ease of riding, long life of bearings and absence of repairs. Also the Iver Johnson finish of five coats of baked, hand-rubbed enamel is better than the usual paint and varnish finish. The frame is of seamless steel tubing, not welded tubing.

Before you buy a shot gun, inspect our new double gun and our splendid line of single barrel shot guns.

Our 82-page Book

Tells all about Revolvers, Shot Guns, Bicycles and Motor Cycles. It tells you what you must know to get highest value for your money. Your copy is free.

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Everybody's Riding This Year

This is our $40 Model

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Like the Boys Who Ride Them—

Sturdy, strong, upstanding
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'Chain' Tread Bicycle Tires

are made to fit the needs of youngsters and oldsters, too, who want long service anti-skid tires on their "wheels."

Ride on 'Chain' Treads

See how they cling to the slipperest road—how they fairly lift you out of loose sand, and how hard it is to puncture them, or wear them out; and you, too, will join the great army of bicycle riders who say—"There's no tire quite so good as a 'Chain' Tread."

Good tire dealers always sell 'Chain' Treads—and those same dealers have Dan Beard's new book for boys which they will give free to any boy who asks for it.

United States Tire Company

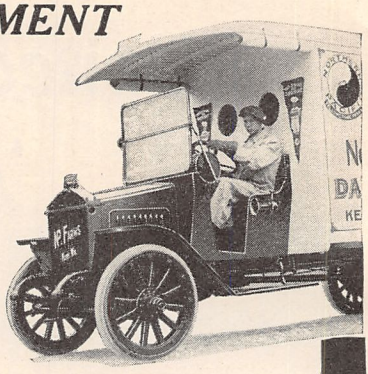
'Chain' Tread Single Tube 'Chain' Tread G. & J. Double Tube

BICYCLE TIRES

DENBY TRUCKS

FOR TRAIL OR PAVEMENT

Denby trucks are superior trucks at lower prices. Denby methods make Denby prices possible. Denby standards guarantee Denby quality



1-ton . . $1020
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1½-ton . . $1575 **2-ton . . $1790** **2½-ton . . $2090**

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A day in the woods with a Hawkeye Basket. Fish, hike, smoke, read and rest in the woods and take along the eatables and drinkables in a

Hawkeye BASKET REFRIGERATOR

the wonderful woven reed basket with the nickel plated interior that keeps food and drink cool, clean and fresh for 36 hours—all from a small lump of ice placed in the ice compartment of the basket. Practical, handsome, light weight and cleanly. The Hawkeye Basket Refrigerator has been the keynote of hundreds of enjoyable "days in the woods." **Price $4.00 and up**

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Before it has had to make profits for people all along the way between the factory and the home. Come-Packt furniture saves these profits. You get it practically at factory cost, plus freight, which is very low, because Come-Packt is sent in sections. You put it together yourself. That's why it's so surprisingly cheap—so cheap that some people can't realize, until they see it, that it compares with the finest furniture made. Remember this when you

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Factory Price $28.75

48-in. Top

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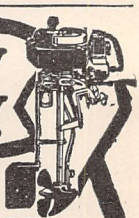
SECTIONAL "COME-PACKT" FURNITURE

Extra money for you now



You *need* more money this summer—and here's a dignified, easy way to get it. Take orders for the

Wisconsin Detachable Row Boat Motor

Equip your boat with a guaranteed Wisconsin—enjoy yourself while demonstrating and making money. Thousands in use. Everyone interested. Has many exclusive features including self-locking tiller and patented top adjustment, which make the Wisconsin the *best* row boat or canoe motor to use, and the easiest to sell. Ask for our agents' plan. **Ask for catalog Q.**

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11 Minor St., Milwaukee, Wisconsin

Highest Award Panama-Pacific Exposition. Purchased by U. S. Government, after competitive tests.

Please Mention Popular Mechanics

All You Need is a Road Map

THROW away your railway time tables and choose your own road. No buying of tickets or waiting for trains—just mount and ride any time, any place—in safety and comfort. You can do this when you own a Harley-Davidson Motorcycle. The

Harley-Davidson

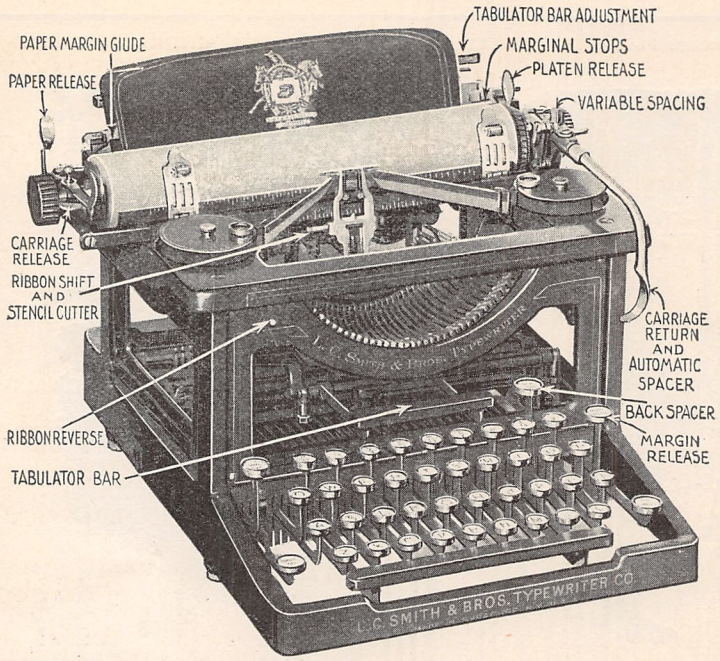
throws open for you the gates of the big outdoors. On the broad, smooth city pavements, in the winding country roads, in the woodland by-paths that lead to the wild places—you can satisfy that travel hunger and find hours and hours of keen, healthful recreation—priceless pleasure.

The 1916 Harley-Davidson will win you with your first ride. You will catch the "motorcycle" spirit before you have ridden half a mile. You will experience a thrill of pleasure you never knew before. Decide now that you will learn to laugh at distances.

Telephone your Harley-Davidson dealer for a demonstration.
He will probably make terms to suit your convenience.
Write for catalog.

Harley-Davidson Motor Co., 468 B STREET ***Milwaukee, Wis.***

Producers of High-Grade Motorcycles for More Than Fourteen Years



I want, through this advertisment, to establish as friendly business relations with you as I possibly can. I want you to realize also, that it is my earnest effort and intention to give you full honest value for every dollar that you spend with me. This is the only way I can succeed. The publisher of this magazine will vouch for my square dealings during the four years and more my advertising has appeared.

I am building up my business on the foundation of good value and square dealings. I am saving thousands of satisfied customers thousands of dollars, by supplying, perfect—late style—visible writing—typewriters, at remarkably low prices.

All my transactions are handled throughout by personal correspondence, I assure you every courtesy and consideration, in your dealings with me. Your order will have my prompt, careful, personal attention. I will be glad to do business with you.

Harry A Smith

TYPEWRITER SENSATION

Free TRIAL—Use As You Pay

Send me only $2.50 a month until the low total price of $48.80 is paid, and the machine is yours

This is absolutely the most generous typewriter offer ever made. Do not rent a machine when you can pay $2.50 a month and own one. Think of it—Buying a $100.00 machine for $48.80. Cash price, $45.45. Never before has anything like this been attempted.

Standard Visible **L. C. Smith** Model Number 2

Perfect machines, Standard Size, Keyboard of Standard Universal arrangement writing 84 characters—universally used in teaching the touch system. **The entire line of writing completely visible at all times,** has the tabulator, the two color ribbon, with automatic reverse, the back spacer, ball bearing type bars, ball bearing carriage action, ball bearing shift action, in fact every late style feature and modern operating convenience. Comes to you with everything complete, tools, cover, operating book and instructions, ribbon, practice paper—nothing extra to buy. **You cannot imagine the perfection of this beautiful reconstructed typewriter until you have seen it.** I have sold several thousand of these perfect latest style Model No. 2 machines at this bargain price and every one of these thousands of satisfied customers had this beautiful, strictly up-to-date machine on five days' free trial before deciding to buy it. I will send it to you f. o. b. Chicago for five days' free trial. It will sell itself, but if you are not satisfied that this is the greatest typewriter you ever saw, you can return it at my expense. You won't want to return it after you try it—**you cannot equal this wonderful value anywhere.**

H. A. SMITH
Room 510-231 N. Fifth Ave.
CHICAGO, ILL.

Ship me a No. 2 L. C. Smith F. O. B. Chicago, as described in this advertisement. I will pay you the $40.00 balance of the SPECIAL $48.80 purchase price, at the rate of $2.50 per month. The title to remain in you until fully paid for. It is understood that I have five days in which to examine and try the typewriter. If I choose not to keep it I will carefully repack it and return it to the express agent. It is understood that you give the standard guarantee for one year.

Name .....

Address .....

.....Pop. Mech. May

You Take No Risk—Put In Your Order *Now*

When the typewriter arrives deposit with the express agent $8.80 and take the machine for five days' trial. If you are convinced that it is the best typewriter you ever saw, keep it and send me $2.50 a month until my bargain price of $48.80 is paid. If you don't want it, return it to the express agent, receive your $8.80 and return the machine to me. I will pay the return express charges. **This machine is guaranteed just as if you paid $100.00 for it.** It is standard. Over one hundred thousand people own and use these typewriters and think them the best ever manufactured.

The supply at this price is very limited, the price will probably be raised when my next advertisement appears, so don't delay. Fill in the coupon today—mail to me—the typewriter will be shipped promptly. There is no red tape. I employ no solicitors—no collectors—no chattel mortgage. It is simply understood that I retain title to the machine until the full $48.80 is paid. **You cannot lose. It is the greatest typewriter opportunity you will ever have. Do not send me one cent. Get the coupon in the mails today—sure.**

HARRY A. SMITH, 510-231 N. Fifth Ave., Chicago

EMERSON PHONOGRAPH

only $3 complete

Will play all makes of disc records, without extra attachments.

Hand regulated spring motor, guaranteed to play two or three small or the largest disc records with one winding.

Sound box is of strongest construction—made to last many years.

Oak finish, size 9½ x 9½ x 12 inches. Weight, packed, 8½ lbs., unpacked, 6½ lbs. Easily carried in suitcase.

$3.50
West of the Rockies

Just the machine you've wanted

A Phonograph which will play any disc record made. It is the most wonderful Phonograph value ever offered.

A fully adjusted musical instrument which plays ragtime, opera, vocal and instrumental selections with equal clearness of sound.

The horn is a strong feature—it produces a volume of sound equal to that of any machine you can buy at ten times the price.

The motor is mechanically perfect and of sturdy construction. The sound box is of special design.

It's the ideal Phonograph for camp or bungalow, pleasure boat, canoe or playroom. It will give pleasure to grown-ups and delight the children. It is for all places where a more expensive Phonograph is impractical or not available.

FREE Complete list of records including Charlie Chaplin's "Peace Patrol," "Mother," "I Love a Piano," and all the other big hits.

Send the coupon and get this pamphlet which gives all the details of this wonderful Phonograph, the greatest value ever offered at the price.

Order your Emerson today—it will be sent you all charges paid. Order records at the same time. We will send you the newest numbers.

The Emerson Phonograph Co.

9 West 35th Street, NEW YORK

Dealers:

The Emerson is taking a strong hold everywhere! It is an item that will bring new customers and big profits. Get in touch with us regarding our attractive proposition. Write or wire. Earliest inquiries receive first preference.

For JOLLY TIMES— GET AN EMERSON

When the fellows call, don't let them sit around wishing they hadn't come. Put life and pep into the crowd—play the Emerson. Everybody will sing, dance and be happy. The chaps will call again and again—your room will be a regular club.

EMERSON RECORDS At 10c and 25c

are wonderful features. Never before have such records, by the greatest bands, orchestras and artists been offered at 10 cents. The Emerson list comprises all the latest popular marches, dance music, medleys, songs, etc., as well as string and orchestra selections.

6 inch records are.....10c
7 inch records with music both sides—2 different selections 25c

SPECIAL INTRODUCTORY OFFER

EMERSON PHONOGRAPH CO.
9 West 35th Street, New York

Gentlemen: Enclosed find $( ) for which send me, all charges paid:

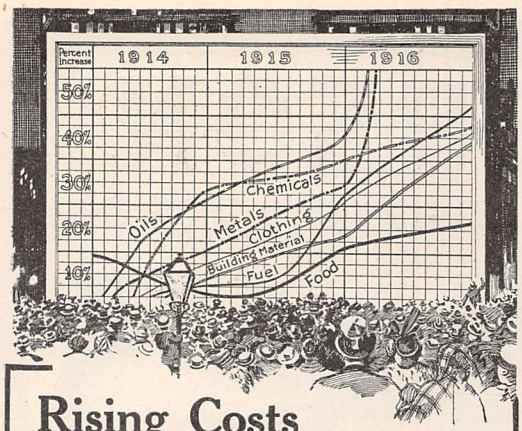
1 Emerson Phonograph Type 1A, at $3.00
($3.50 west of the Rockies).
Emerson Discs (6 inch) at 10c
Emerson Double Discs (7 inch) at 25c
Send me FREE Pamphlet and Record List.

Name .....

Street No. .....

City or Town.....**State**.....

Please Mention Popular Mechanics



Rising Costs Confront Everybody

No statistical chart is needed to prove that this is a period of price advancement without parallel. The effect of higher prices is felt by everyone. It is a time for taking advantage of every opportunity that offers a genuine saving.

Certain-teed

Roofing

lowers the cost of building

CERTAINTEED offers a substantial saving in roof construction. It costs less to buy, less to lay, less to maintain and less per year of life. The General is able to make the best roofing at the lowest cost because of economies effected by enormous resources, modern machinery, favorably located mills and tremendous production (the General makes one-third of all the roll roofing made in America).

CERTAINTEED Roofing is made of the best quality roofing felt thoroughly saturated with the General's own blend of soft asphalts and coated with harder asphalts which keep the inner saturation soft and prevent the drying out process so destructive to ordinary roofing. **CERTAINTEED** is guaranteed for 5, 10 or 15 years, according to ply. Experience proves that it lasts longer.

CERTAINTEED is sold by responsible dealers everywhere at reasonable prices — investigate it before you decide on any type of roof.

Save Rags — They're Valuable

Rags now bring eight times as much as a year ago. The demand for rags for making roofing felt, writing paper, etc., has reached tremendous proportions — a half million tons of rags being used last year. The increase in price of rags used by the roofing mills alone amounts to $40,000 a day. Gather up all the rags around the place and sell them at present high prices. If you are not offered their real value, write our nearest office.

General Roofing Manufacturing Co.

World's Largest Manufacturers of Roofing and Building Papers.

New York City	Chicago	Philadelphia
St. Louis	Boston	Cleveland
Pittsburgh	Detroit	San Francisco
Cincinnati	New Orleans	Los Angeles
Minneapolis	Kansas City	Seattle
Indianapolis	Atlanta	Richmond
Houston	London	Sydney

Prest-O-Lite for Motorcycles

The Light for Constant Service

Prest-O-Lite furnishes ideal riding light. It enables you to ride safely on any road under all conditions—provides a flood of brilliant, penetrating light and never fails you in emergencies.

Road shocks, jolts and vibration do not injure it.

Prest-O-Lite is truly as sturdy as your motorcycle and never needs attention that you yourself cannot give easily, quickly and inexpensively.

Because it has proved its superiority, you'll find more riders using Prest-O-Lite than all other systems combined. It is the utmost in economy, lasting efficiency, practical convenience and reliability. You can get it on any make motorcycle you buy.

When You Buy Complete Equipment

Buy equipment that will stand hard and continued use. On any motorcycle you buy, your dealer can furnish this attractive equipment combination—"Prest-O-Lite, a lamp and a good mechanical horn," at a very attractive price. Saves money on original cost, and costs less to use.

The Prest-O-Lite Co., Inc.

The World's Largest Makers of Dissolved Acetylene

265 Speedway, **Indianapolis, Ind.**

Canadian Office & Factory, Merritton, Ontario

Prest-O-Lite Exchange Agencies Everywhere

Refreshing as a May Morning

That piquant, fresh-as-the-morning flavor you get in a cigarette of "Bull" Durham tastes as cheerful and bracing as the crisp air of the hunting field. Life and spirit — vim and vigor — they're all in a smoke of "Bull" Durham!

GENUINE

"BULL" DURHAM

SMOKING TOBACCO

Ask for FREE package of "papers" with each 5c sack.

The one tobacco in the whole world with real distinctiveness in its flavor and real uniqueness in its aroma is "Bull" Durham.

Deliciously mellow-sweet and delightfully fragrant, "Bull" Durham is most wholesome—most satisfying.

"Roll your own" with "Bull" Durham and learn the joy of smoking *fresh-made* cigarettes.

THE AMERICAN TOBACCO COMPANY

The Magic of Motor Wheeling

THERE'S a world of wholesome fun and ready service in a bicycle. Thousands are returning to the two-wheeler.

Smith Motor Wheel DETACHABLE

But to endow your bicycle with motor life—new riding power—obedient at the slight touch of a thumb lever—that is to lend real enchantment to bicycling.

And *there* is the magic of Motor-Wheeling.

The SMITH MOTOR WHEEL attaches to *any* bicycle in five minutes, and the first short spin will foster friendship. Two pedal turns awaken the power and your foot work is done.

The sturdy motor affords any speed from four miles to twenty. And you ride safely, clean, without vibration. No special riding togs are necessary.

Up to 125 miles of new pleasure in every gallon of gasoline. There are more than 10,000 motor-wheelists now!

You will want to join them.

See your dealer today, or write for our book, "Motor-Wheeling"

MOTOR WHEEL DIVISION

A. O. SMITH COMPANY, Milwaukee, Wisconsin

World's Largest Manufacturers of Automobile Parts

Dealers: A few exclusive territories are still open Write for particulars.

Double the Pleasures of Summer Days

YOU'VE waited for the coming of summer—for the call of the great outdoors with its healthful, pleasurable sports. Like thousands of others who are answering that call, you too, can double the pleasures of summer days—Evinruding. Just clamp an

EVINRUDE

DETACHABLE ROWBOAT & CANOE MOTOR

on the stern of that old rowboat of yours. Then, a turn of the wheel and you're off—skimming over the water at 7 or 8 miles an hour—with no thought of a long row home again. Today, tomorrow, any time you wish—long, healthful hours of pleasure are yours, if your rowboat is Evinrude-equipped.

There's more speed, more power in the new EVINRUDE four-cycle Twin—and it's free from vibration. There's more speed too, and other improvements in the single cylinder models. The 1916 *Evinrude* models are equipped with the Automatic Reverse and the *Evinrude* Magneto—Built-in Fly-Wheel Type

Mail the Coupon or Write Today for Handsomely Illustrated 1916 Evinrude Catalog

EVINRUDE MOTOR COMPANY, 357 Evinrude Block, Milwaukee, Wis.

Distributing Branches—69 Cortlandt Street, New York, N. Y.; 214 State Street, Boston, Mass. 436 Market Street, San Francisco, Cal.; Front and Morrison Streets, Portland, Ore.

EVINRUDE MOTOR COMPANY
357 Evinrude Block
Milwaukee, Wis.

Kindly send me a copy of the 1916 Evinrude Catalog.

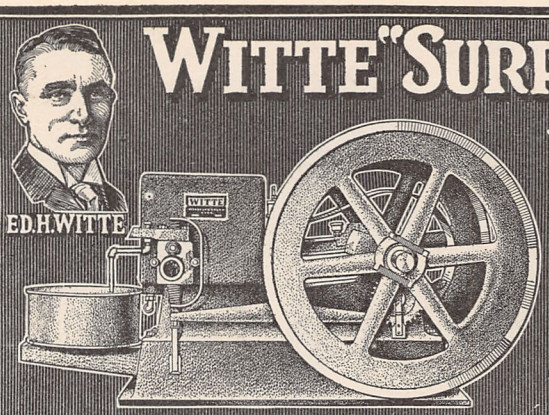
*Name*_____

*Address*_____

*City*_____ *State*_____

Over 60,000 Sold

WITTE "SURPLUS SIX"



SOLD FOR 6 H.P.
PULLS 9 H.P.
ONLY
$97.75

ANY SIZE—2, 3, 4, 6, 8, 12, 16, OR 22 H.P.
ALL LESS THAN $17.50 Per H.P.

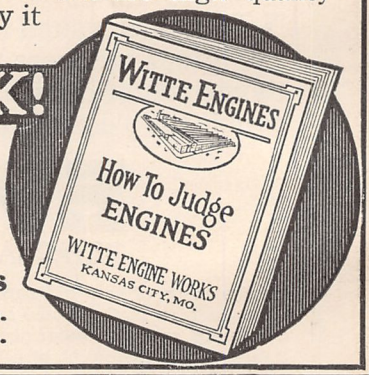
KEROSENE, GASOLINE, NAPHTHA, DISTILLATE OR GAS.

90 DAYS IN WHICH TO TRY A WITTE

MY 1916 Model engines are the greatest value that I have known to be offered at anything like the price. All sizes will pull from 30 to 50 per cent over factory rating. They are sturdy and dependable—expert built and high quality in every respect. Lowest cost of operation.

Trial Offer
Easy Terms

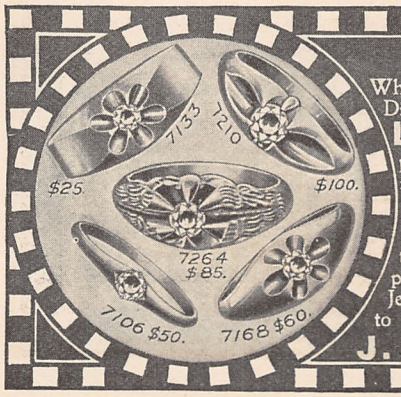
I want you to be the judge of my engine. Write today for my free trial offer. Find out for yourself that WITTE engines are not "cheap" engines but are high quality engines **priced low.** Use one on your farm—try it out thoroughly—and let me know your decision.



GET THIS FREE BOOK!

Don't buy **any** engine blindly. Send for this book. Learn "inside" facts about the engine business. Full of interesting—some startling—information.

ED. H. WITTE, Witte Engine Works
1746 Oakland Ave., Kansas City, Mo.
1746 Empire Building Pittsburgh, Pa.



DIAMONDS ON CREDIT

Whether for personal use, or as a gift, nothing can compare with a Diamond, *if it be of pure quality.*

Lyon Diamonds are absolutely free from flaws or imperfections and of the rich Blue-white color. Every honest person is offered our liberal terms of

20% Down and 10% A Month

With every Diamond we furnish a Guarantee Certificate attesting the quality and value, and providing for exchange at full purchase price. Send for Catalog No. 3, showing splendid line of Watches, Jewelry and Silverware. Goods sent prepaid for inspection, subject to approval. *10% Discount Allowed for Cash.*

J. M. LYON & CO., Est'd. 1843 **71-73 NASSAU STREET NEW YORK CITY, U. S. A.**

Brand New Glove for Mechanics

Made from Peccary Pigskin

In the forests of Central America roams the Peccary Hog. It is hunted almost exclusively for its hide, which has been found to fill all requirements of leather for sturdy work gloves.

The skin differs widely from that of the common domestic hog—being heavier and softer. One pair of gloves made from this leather will outwear several pairs of the domestic kind.

Get the Peccary Pigskin Glove—it's one of the new

Grinnell-Gloves

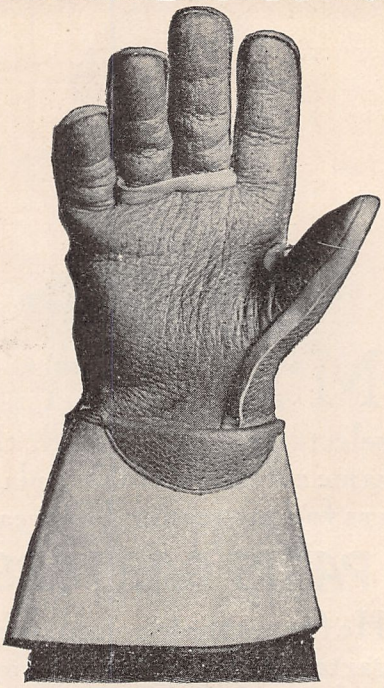
Best for every purpose

To give the greatest amount of hand protection, a work glove must be heavy and durable. But it also must be soft and pliable—and this is why the Peccary Pigskin leather is so satisfactory. Delicate adjustments can be made with barehanded ease.

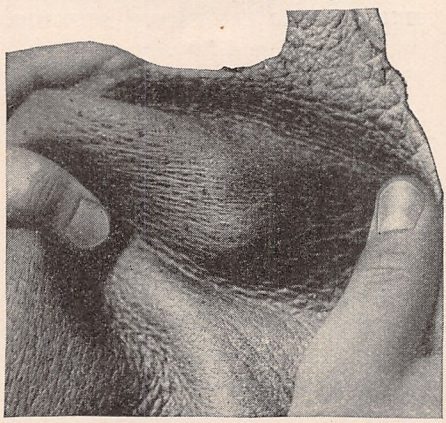
Peccary leather samples, free

Write for some of this wonder leather, also our new booklet, "Glove Styles." Both sent free. Please give dealer's name.

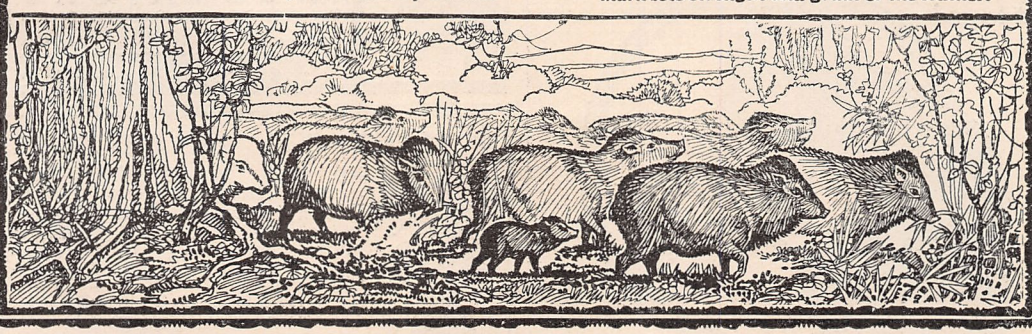
Morrison-Ricker Mfg. Co.
(Established 1856)
141 Broad St., Grinnell, Iowa



New heavy work gauntlet—made from Central American Peccary Pigskin.



Actual photo of Peccary Pigskin, showing remarkable strength and grain of the leather.



Manager Joe Tinker of the Chicago Cubs selects his apparel with the same care that he picks players for his team. He wears

PARIS GARTERS

He favors these comfortable garters because they always make good; hold up his socks neatly and give long service.

25 and 50 cents

Look on the back of the shield for the name PARIS.

A. Stein & Co.
Chicago New York

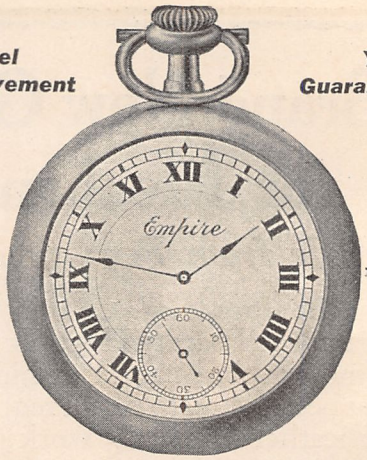
PARIS GARTERS
No metal can touch you

They die outdoors!

No mixing
No Spreading—
No Muss—No Trouble
Just crumble up a
Rat Bis-Kit
about the house. Rats will seek it, eat it, die outdoors. Easiest, quickest, cleanest way. Large size 25c. Small size 15c. All druggists or direct prepaid. THE RAT BISCUIT CO., 1065 North Limestone St., Springfield, Ohio.

For roaches and water bugs use Rat Bis-Kit Paste —the new Poison in the Tube—25c.

23 Jewel Movement **20 Year Guarantee**



This Superb Watch *SENT FREE*

Get full particulars of our smashing direct price offer. Buy direct—save all middlemen's profits. This masterpiece of watch manufacturing—23 jewels, adjusted to temperature and isochronism. Thin model, **guaranteed 20 year gold filled case** sent **Free** on request.

NO MONEY IN ADVANCE If you decide to keep it, pay only **$1.80 a month** on our **confidential inside price.** You can easily afford to own a perfect timepiece on our easy payment plan. Get our amazing low direct price to you. Watches, Diamonds, Jewelry, etc., on the easiest Monthly payments as illustrated in our Catalog De Luxe No. 6.

A REMARKABLE OFFER OUR DIAMONDS are absolutely guaranteed and can be returned if not satisfactory. A binding guarantee furnished with each diamond. Exchangeable at any time at an increase of 7½ per cent **more than you paid.**

A postal will bring full details of this great offer. Don't let an opportunity like this slip through your fingers. Write today—NOW.

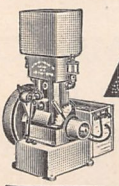
L. W. SWEET & COMPANY Dept. 6, 2 & 4 Maiden Lane NEW YORK CITY
The World's Greatest Diamond Merchants

Write for this free booklet
about Modern Firearms. It tells you all about the latest improvements, contains descriptions and illustrations of all models made up by **The REMINGTON ARMS UNION METALLIC CARTRIDGE CO., Dept. 5-P, NEW YORK**

JENKINS' BRASS BAND AND ORCHESTRA INSTRUMENTS

We save you money and give easy payments. Biggest line of Band and Orchestra Instruments; Cornets, Trombones, Clarionets, Drums, Saxophones, Violins, Guitars and all wind and stringed instruments. Send for free catalog of instrument you want. We give a fifty-lesson **FREE** certificate with each instrument. Tell us the instrument you wish to play,

JENKINS MUSIC CO., 83 Jenkins Bldg., **KANSAS CITY, MO.**



SMALL ENGINES
Perfected Gasoline Engines—½, 1 and 1½ h. p.—for Farm and Shop use. Price $19.50 and up. Also
INCUBATORS
We ship on trial. Send for Booklet and Special Offer.
SIEVERKROPP ENGINE CO.
1224 18th St. RACINE, WIS.
STARTER for FORD CARS

Runs on Alcohol

anywhere. No electricity, wires or springs. Convenient. Much cheaper to operate than other fans. 12-inch blades. Roller bearing. Reliable. Brings genuine comfort and satisfaction. Ideal for the sick room. Third season. A proved success. The WONDER FAN.
Price, $16.50 cash with order only, delivery prepaid in the continental U. S. A.
LAKE BREEZE MOTOR, 122 N. Jefferson St., Chicago

Velvet Joe's Able Assistants--

Mother Nature and Father Time made diamonds out of carbon. But pshaw! Look what their method does with tobacco.

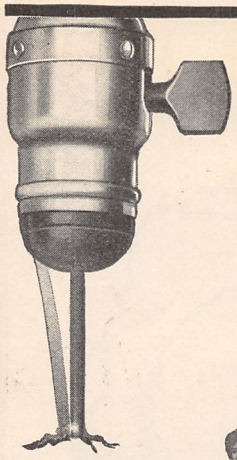
Two years of it make VELVET.

Velvet Joe.

FOR VELVET is matured by two full years of ageing in Nature's patient way. The result is that mellow aged-in-the-wood smoothness that no other smoking tobacco possesses.

You can't get that smoothness in any other way.

Liggett & Myers Tobacco Co.

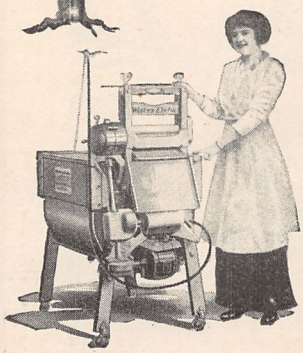


Wash With Electricity Without Muss or Fatigue

Right in your own laundry—in the electric light socket—is all the power necessary to do your washing. Why go on with the old-fashioned washboard or hand-washer way? Why not take advantage of the help so close at hand and which costs so little?

The newest, most useful, most convenient laundry appliance is the

Western Electric
Washer and Wringer



No paddles, agitators or other contrivances to mash, twist or tear the clothes. No injury to most delicate laces. The wringer is reversible. All mechanism is enclosed.

You can arrange for a *Two Weeks' Trial* in your own home. Take advantage of this opportunity. Write to us for particulars. Drop a post card to our nearest house, and ask for Booklet No. 92-AW.

WESTERN ELECTRIC COMPANY
INCORPORATED
463 West Street, New York 500 South Clinton Street, Chicago
Houses in All Principal Cities

DO YOU INTEND TO BUILD?
50 PRACTICAL PLANS

California Bungalows and Houses especially suited to any climate. New, attractive designs with valuable building suggestions all in handsome **1916 Art Plan Book. Price 50c postpaid.** Send today for your copy. Save time, trouble. Money refunded if not satisfactory. Address

BUILDING DEPARTMENT
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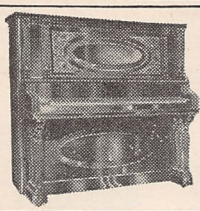
1001 State Nat'l Bank Bldg. OKLAHOMA CITY, OKLA.



3 YEARS TO PAY

Meister Piano 30 days free trial in your own home
$1 A WEEK or $5 A MONTH **Price $175.00**
No cash payment down. No interest —no extras. Piano stool and scarf free

ROTHSCHILD & COMPANY
Dept. 16V CHICAGO, ILL.

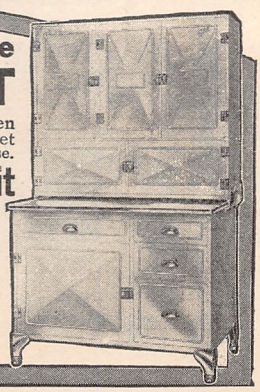
THIS BUNGALOW $900 CAN BE BUILT FOR

This and many others in my new book, Building Plans for Modern Homes, will save you hundreds of dollars. One of the most complete and comprehensive books of plans ever published by any architect. Fifth edition just off the press. Two hundred and fifty floor plans and photographs of bungalows, etc., costing from $200 up; gives sizes and cost to build. **Sent postpaid for $1.00**

FREDERICK H. GOWING
ARCHITECT
18 Tremont St., BOSTON, MASS.

Write for the Wholesale Price

Get This All Metal, Snowy White KITCHEN KABINET



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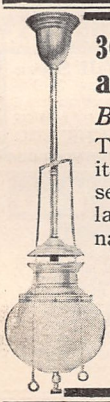

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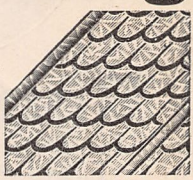

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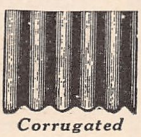

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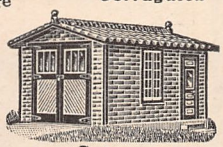

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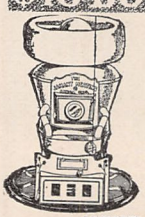

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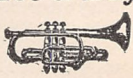

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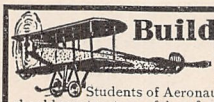

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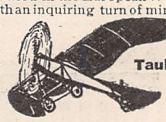

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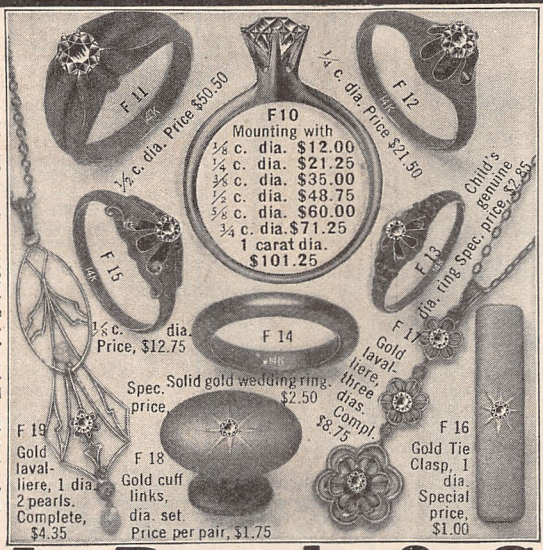

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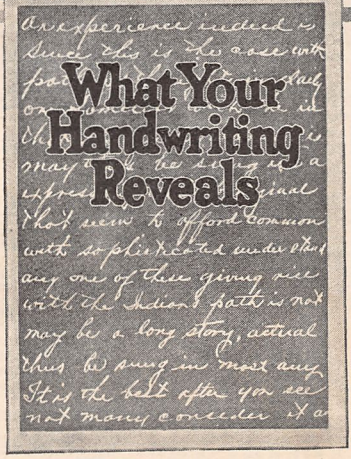

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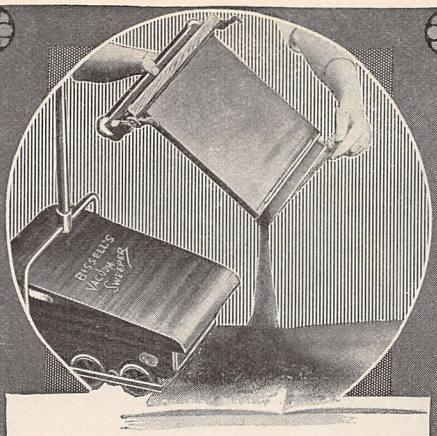

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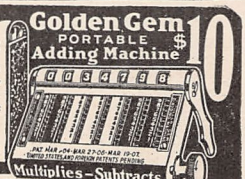

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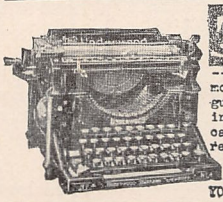

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-- All Makes, Factory Rebuilt by the famous "Young Process"; look like new, guaranteed like new. Our big business insures "Square Deal" and permits lowest cash prices -- $10 and up; also machines rented -- or sold on time. No matter what your requirements are, we can best serve you. Write and see - NOW.
YOUNG TYPEWRITER CO. Dept. 359 CHICAGO

TYPEWRITERS ALL MAKES ALL PRICES

Look at these bargains! Typewriters Rebuilt in our own Factories and guaranteed for one year.

Remingtons $15 to $65	Smiths $18 to $50
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L. C. Smiths $28 to $60	Olivers $23 to $45

Brand new No. 2 Smith-Premiers $45
We have others, of course. Send for catalog describing them. Branch offices in principal cities.
American Writing Machine Co., Inc., 345 Broadway, N. Y.

TORREY Razors

make smooth shaving a daily delight

With a **Torrey** you always shave clean and smooth, because it has the perfect shaving edge. Adjusted to glide over the face at the right angle. Cuts close, without pulling, without roughing the skin.

A *Real Man's* Razor—
this beautiful razor is one of the finest examples of Torrey skill in razor making. It guarantees comfortable shaving.

If your dealer hasn't Torrey razors, write to us; we'll tell you where to get them, and send you FREE booklet, "How to Shave."

The Torrey Honing Strop has no equal

The J. R. Torrey Razor Company
Dept. P, Worcester, Mass.

D·H·S·'16 No. 46

BEAUTIFUL PINS

For any school or class. No. 46, any letters or date, hard enameled, two colors, silver plated 15c each, $1.50 doz. Sterling silver, 30c each, $3.00 doz. CATALOG FREE.

Metal Arts Co., Inc., 91 South Ave., Rochester, N. Y.

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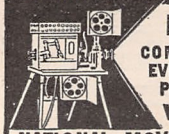

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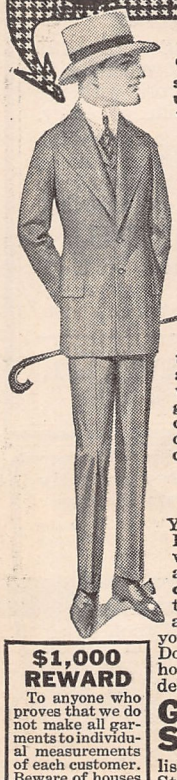
BIG CHANCE FOR AGENTS

You can earn BIG MONEY
selling the most complete line of guaranteed transparent handle Knives and Razors with Photo, Name and Lodge Emblem—also full line of cutlery. Write today for catalogue and terms.
Golden Rule Cutlery Co., 554 W. Lake St., Dept. 328, Chicago, Ill.

$22.00 for $3.36

AGENTS 10 Piece Aluminum Set makes **15 Combinations** enough for **whole Kitchen Outfit.** Worth **$22.00;** retails **$3.36.** Biggest value ever offered. **$100 a week easy.** Be first in your territory. Write quick. Address
AMERICAN ALUMINUM MFG. CO., Div. RP., LEMONT, ILL.

Have Your Suit Made To Order and Take 6 MONTHS TO PAY.



Here it is—the biggest sensation in the history of high class tailoring! Think of getting a suit tailor made **strictly according to your own individual measurements and having six whole months to pay for it!** Yes, no matter who you are, where you live, or what you do, we will make you the finest, the richest, the snappiest suit you ever saw and give you **an entire half year to pay for it!** Don't miss this amazing opportunity.

Save Half

You actually and positively get the suit **at about half of what it would ordinarily cost you!** Our tremendous woolen buying gives us the pick of the world's greatest mills at lowest prices known. Therefore we can cut the price in **half and still** give you six months to pay. Don't buy cheap "ready mades" and pay double our price. Don't pay other tailors two or three times as much as we charge.

Only $2.50 Per Month

You wear the suit while paying for it. Payments so marvelously easy you won't miss the money. We trust you absolutely. **Your word is all the security we ask.** No reference, no red tape, no delay, no collectors. No strings attached to this credit whatever. It's yours to use as freely as you wish. Don't class us with ordinary tailoring houses. We are "different!" You'll be delighted.

$1,000 REWARD
To anyone who proves that we do not make all garments to individual measurements of each customer. Beware of houses that try to palm off altered "ready mades" claiming them to be made-to-order.

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The most sumptuous style book ever published—our 1916 Spring and Summer Style Book! See the actual cloth samples of most beautiful weaves and patterns—the newest and latest. Also illustrations of choicest designs from world's greatest style centers. You'll marvel at this wonderful book.

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Please send me, FREE, your new DeLuxe Style Book and full particulars of your great offer.

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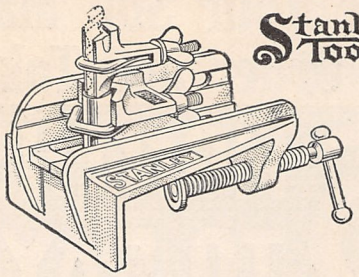


Stanley Doweling Jig

A new and most unique tool that will enable the user to bore dowel holes in the edge, end or surface of work with the greatest ease and with absolute accuracy.

A tool that will immediately commend itself to Carpenters, Cabinet Makers, Pattern Makers, —in fact, to every artisan or amateur who has occasion to do any kind of doweling.

Price, Each, $1.75

If you cannot procure this tool from your hardware dealer, we will send same, postage prepaid, on receipt of the price mentioned above.

ADDRESS

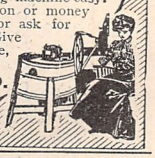
STANLEY RULE & LEVEL CO.
NEW BRITAIN, CONN. U.S.A.

Make Water Pressure Work and Save Your Back

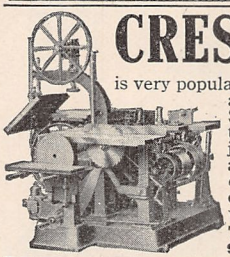
The Divine Red Devil Water Motor built with bucket-wheels like big water wheels—easy to install, has nothing to get out of order and does work at very low cost.

4 in. Motor Complete, $3. Including Emery, Buffing Wheel and Pulley for household use. With pulley for sewing-machine only $2.50.

6 in. Motor with Pulley, $5. For Mechanics, Tradesmen, Doctors and Dentists and the Home. Will run washing machine easy. Guaranteed to give satisfaction or money back. Order direct NOW or ask for descriptive Booklet FREE. Give size of pipe and water pressure, and work to be done.



DIVINE WATER MOTOR CO.
Dept. P., Utica, N. Y.

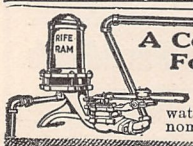


CRESCENT Wood Working Machinery

is very popular with those particular users who always insist on having the best. Send today for our catalog illustrating and describing band saws, jointers, saw tables, planers, planer and matchers, disk grinders, swing cut off saws, shapers, borers, hollow chisel mortisers, universal wood workers, variety wood workers.

The Crescent Machine Co.
93 Columbia Street, LEETONIA, O.

BABY FAR AT SEA SAVED BY WIRELESS—A wireless message recently picked up by the Cape Hatteras station received such prompt attention that a life was in all probability saved thereby. The message stated that a baby on board a vessel several hundred miles away was critically ill and that the ship's physician had



A Constant Water Supply For Your Farm Home

Don't depend on a windmill or the back-breaking hand pump to fill your water tank. It's more reliable and economical to install a

RIFE RAM

and be sure of a constant supply of fresh water, without fuel or attention. The Rife Ram operates by the flow of any stream having a fall of 3 feet or more and a supply of 3 gallons or more per minute. Will maintain air pressure system. Simple to install. Over 11,000 in use. Satisfaction guaranteed.

Write today for catalog and free estimate

RIFE ENGINE CO.
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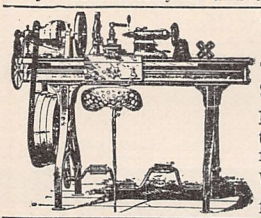
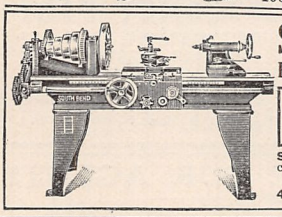


LATHES

9 to 18-inch Swing

List price $75 and up according to size. When ready to buy send for Lathe Catalog and prices.

W. F. & John Barnes Co.
100 Ruby Street, ROCKFORD, ILL.



South Bend Lathes

For the Machine and Repair Shop

How to Run a Lathe
A 50-cent book for 10 cents. Postpaid, stamps accepted.

Straight or Gap Beds. Send for free catalog giving prices on entire line.

SOUTH BEND LATHE WORKS
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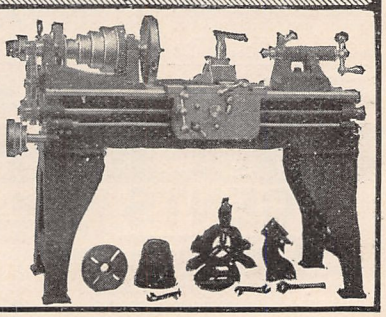
SEBASTIAN LATHES HIGH QUALITY LOW PRICES

If you delight in good tools you will delight in Sebastian Lathes. For 25 years we have built lathes, and lathes only, employing skilled labor always, and improving equipment and machinery every year. Sebastian Lathes are

STANDARD FOR QUALITY—LOW IN PRICE

They are accurate, economical, simple and durable. Many re-orders and voluntary letters from users of Sebastian Lathes prove this.

The Sebastian reputation is back of every Sebastian Lathe. You are judge and jury when you buy a lathe. We are not satisfied until you are. Look over the complete line in our new catalog. It shows Lathes for general repair work, garage and automobile work, etc.

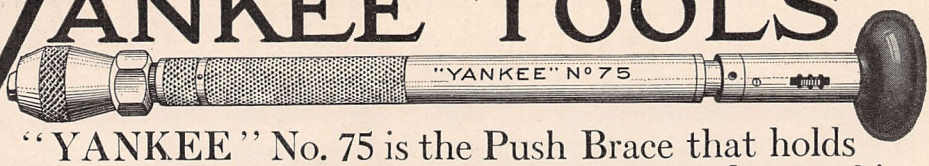


When you buy a lathe, say "Sebastian"

ADDRESS (FOR THE CATALOG)

THE SEBASTIAN LATHE COMPANY, 107 Culvert St., Cincinnati, Ohio

"YANKEE" TOOLS



"YANKEE" No. 75 is the Push Brace that holds same tools as a bit-brace, but revolves *by pushing*. Rapid work!—like "Yankee" Spiral Screw-driver. Chuck holds up to ½ in. squares. Has right- and left-hand ratchet. Price, $2.80.

Drives 3/8" auger bit through hardwood; larger in soft. Drills 3/16" holes in metal. Drives or draws screws.

"YANKEE" No. 15 is the Ratchet ↑ Screw-driver that starts wobbly screws. You turn Knurled (see ↑) Washer with thumb and forefinger while the hand steadies driver and screw. Then ratchet home.

2-in. blade, **40c**; 3-in. **45c**; 4-in. **50c**; 5-in. **55c**; 6-in. **60c**; 8-in. **70c**.

"YANKEE" TOOLS *Make Better Mechanics* **Your dealer can supply you**

North Bros. Mfg. Co., Philadelphia *Write us for "'Yankee' Tool Book," showing all the "Yankee" wood- and metal-boring and screw-driving tools*

exhausted his skill without avail and appealed to any physician who might get the radio to prescribe for the infant. With the symptoms given, the operator at Cape Hatteras sent the message to a physician near by. The doctor gave him a prescription which was flashed through the air, and a few hours later the operator received another wireless saying the prescription had been filled and that the child had shown immediate improvement and was considered out of danger.

Portable Cases

FOR TOOL MAKERS AND MACHINISTS

Twelve styles, felt lined drawers, solid brass trimmings, best of material, beautiful finish, low prices, satisfaction guaranteed. Ask for booklet of cases built for service.

The Pilliod Lumber Co.
SWANTON, OHIO

Save Your Clothes

If you have any work to do on your car, around the house or in the factory, and want something to protect all your clothes, slip on a

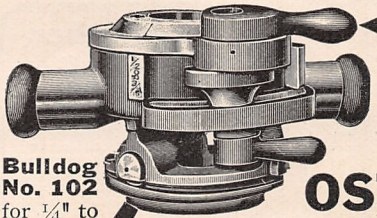
Putting Suit On

Shanhouse MOTOR SUIT

It is a one-piece garment, made of high-grade olive khaki. On in a minute, off in a second. Roomy, comfortable, durable and washable. A handy over-garment for *all* kinds of odd jobs.

If your dealer cannot supply you, send $2.00, giving chest measure and dealer's name. We will send you one direct, prepaid. Money back if not satisfied. (3)

W. Shanhouse & Sons, Dept. 101 Rockford, Ill.



Bulldog No. 102 for ¼" to 2" pipe.

Opens up when the thread is cut

Note the lever at the end of the arrow. When the thread on the pipe is cut, throw this lever to the left and the dies expand, clearing the thread. That is just *one* of the *five* big features of

OSTER BULL-DOG DIE-STOCKS

Ask for the booklet *"The Bulldog Tale"*—it shows you eleven convenient sizes of this tool, plain or ratchet types. Free by return mail on request.

THE OSTER MFG. CO.
2100 East 61st Street CLEVELAND, OHIO

Please send *"The Bulldog Tale"* to

Name.....

Business.....

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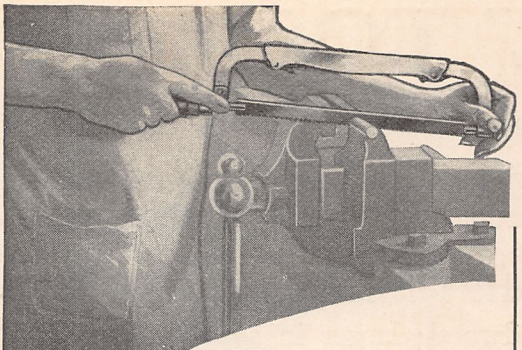


Starrett Hack Saws for Every Job

A Hack Saw that cuts iron pipe would not do satisfactory work in cutting sheet steel.

Good machinists know this and also know that there is a Starrett blade for every purpose.

Seventeen different blades—some differ in shape and size of teeth, some in composition, some in hardness.

Send for free catalog No. 20A.P. It tells what saw to use. Guided by this your work will be clean and rapid and your blades will have long life.

The
L. S. Starrett Co.
"The World's Greatest Tool Makers"
Athol, Mass.
New York London Chicago

Every Builder and Contractor Needs this Level

10 Days' Free Trial

We have been makers of transits and levels since 1863 and our instruments are the standard of the world. Prove the superior quality of the Aloe Convertible Level by giving it a 10 days' free trial. Use it on your every-day work laying out buildings, leveling up foundations, walls and floors, aligning, shafting, piers, etc., for getting angles or levels anywhere.

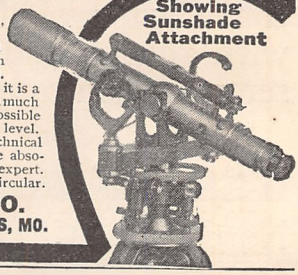
Easy Monthly Payments

If you decide to keep it, the instrument will earn its way while you make monthly payments so small that you hardly feel them. Costs no more than to pay all cash. No red tape about it, no embarrassing questions, everything confidential.

Aloe Convertible Level

is the finest instrument ever offered at anywhere near its price. Permits taking of sights both above and below the horizontal. For taking vertical sights it is provided with a special convertible bracket rigidly and permanently attached to cross bar; telescope, fitted with permanent axis, rests in bracket bearings and held by special clips which can be easily and quickly released.

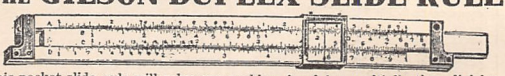
Aside from being a level, it is a modified transit that permits a much wider range of work than is possible with the ordinary architect's level. With it the man without technical training can obtain the same absolutely accurate results as the expert. Write today for descriptive circular.



A. S. ALOE CO.
512 OLIVE ST., ST. LOUIS, MO.

MUSK OX NEARING EXTINCTION—The musk ox is fast following the buffalo to commercial extinction, and its fur will in a few years be as hard to find as a first-class buffalo robe is today, says the Los Angeles Tribune. The animal is found on the shores of the Arctic Ocean in the Mackenzie district. Eskimos hunt the musk ox, which is very gentle and easily taken. The pelts are shipped by dog team and canoe down to the fur-trading posts of the Canadian West. Very few skins can be brought down at a time, and the number of robes on the market each season is necessarily limited. The musk

THE GILSON DUPLEX SLIDE RULE

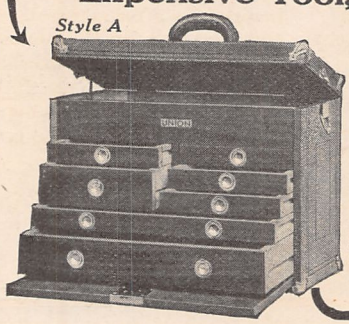


This pocket slide rule will solve any problem involving multiplication, division, proportion, even and uneven roots and powers, Logarithms, and Sines and Tangents. The scales are printed on a white facing, mounted on wood. The runner is made of aluminum, with a glass indicator. Four scales are shown in the illustration and there are five scales on the reverse side. Size 7x1½". Price, with Instructions and Leatherette Case, **$1.25.** Order a **Gilson Duplex Slide Rule.** You can learn to use it in ten minutes. Keep it five days, and if you are not perfectly satisfied send it back and your $1.25 will be promptly returned.

THE GILSON SLIDE RULE CO., NILES, MICH.

Before You Lose Another Expensive Tool, Get a UNION Tool Chest

Style A



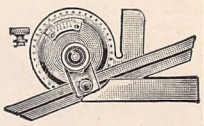
Has a place for every tool. You know immediately if one is gone, misplaced or borrowed. Plain or quartered oak or leatherette cover. Drawers strong and perfectly fitted, some lined with felt. Keeps tools clean, safe and free from moisture. Write now for catalog and prices. If we have no dealer near you, get our special offer.

Union Tool Chest Works
22 Railroad St.
ROCHESTER, N. Y.

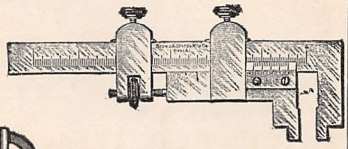
For All Mechanics

Speed up your work and make it easier by getting a good kit of tools. A well-chosen equipment of high grade tools always indicates a skillful mechanic who takes pride in his work. B·S

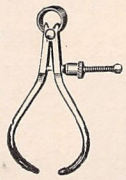
Brown & Sharpe Tools Famous for Fifty Years

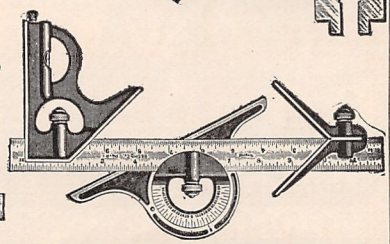


They are regarded as the standard for accuracy, for fine finish, and for handiness by expert workmen all over the world. These are some suggestions from the big line—look them over.



Universal Bevel Protractor, for laying out angles exactly; lays flat on work.
Vernier. Takes outside or inside dimensions from 0 to 6″ by .001″.
Combination Set. Rule, level, depth gauge, square, centre gauge, bevel and protractor all in one.
Caliper. For diameters; well made to stand wear.
Hook Rule. Handy on circular work, or through holes or for setting-dividers, etc.





Good hardware stores will show you many other B. & S. tools.

FREE, a **600-page Catalog.** Just revised and up-to-date. Full of information of interest and help to shop foremen, mechanics and apprentices. Drop a postal asking for Catalog No. 136.

Brown & Sharpe Mfg. Co.
Providence, R. I.

ox has very thick fur. At the base of the long, flowing hair, sometimes 40 in. long, there is a thick growth of wool, so that a robe made up from one of these pelts is capable of withstanding any cold.

YOU NEED THIS TOOL

GASOLINE SOLDERING IRON BLOW-TORCH

Address Dept. I, **Emmelmann Bros. Mfg. Co., Indianapolis, Ind., U.S.A.**

Tool Cases for Toolmakers and Machinists

Keep your tools orderly arranged in a Gerstner Portable Tool Case. There's a place for every tool in one of the felt lined drawers. Every up-to-date mechanic needs one and you'll find our Cases the best built, neatest and most practical on the market. We guarantee to please or refund all money. Write for our free booklet

H. Gerstner & Sons. DAYTON, OHIO

Mfrs. of Mechanics' High Grade Tool Cases
808 Columbia St., DAYTON, OHIO

"Red Devil" Combination Cutting Plier

Insured for 2 Years' Service and You Pay No Premium

A very strong and heavy tool for handling bolts, nuts, pipes, wires, etc. Cuts and stretches wire, acts as a hand vise, etc. This is just one of the styles of

"Red Devil" Dependable Tools

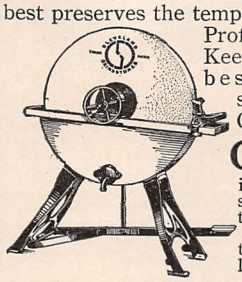
It is insured for 2 years' hard service by a signed bond, or will be replaced free. Style No. 999, size 8½ inches, sample 65 cents.

Tool Booklet sent on request

SMITH & HEMENWAY COMPANY, Inc.
161 Chambers Street NEW YORK CITY

Sharp Tools Pay Big

80% of all edged tools used in America are sharpened by the makers on "Cleveland Grindstones"—the **natural** abrasive stone that best preserves the temper of the steel.



Profit by their experience. Keep **your own** tools at their best with the recognized standard—"Cleveland Grindstones."

Our Little Giant

is built for all ordinary grindstone work in the shop or on the farm. Fitted for hand, treadle or power; 24″ by 3½″ to 4″ stone; ball bearing; latest improvements.

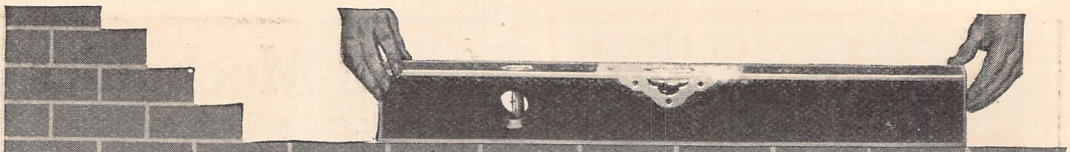
$1 Special Introductory Offer

To prove the superior grit and toughness of "Cleveland Grindstones," we will send this handy "Harvest King, Jr." for **kitchen** or **tool box,** charges prepaid as far west as the Dakotas, Nebraska, Kansas, Oklahoma and Louisiana, on receipt of one dollar.

Send $1 today. Get Free Catalog on Complete Line.

THE CLEVELAND STONE CO.
1111A Leader-News Bldg. Cleveland, Ohio

"Cleveland Grindstones" Save Tool Temper



Makers of Mr. Punch

Buy This—
The Famous Stratton Level

Made in that same slow, careful, accurate way as they were over 45 years ago. You can take it for granted that the man who numbers one of these levels in his tool kit is a good mechanic—a good judge. Every glass in Stratton levels is rigidly tested for accuracy, wood is thoroughly kiln-dried and brass bound levels are made moisture-resisting. All styles to meet all classes of work.

Made and Sold by Goodell-Pratt Company
Makers of 1500 GOOD Tools

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CRESCENT TOOLS

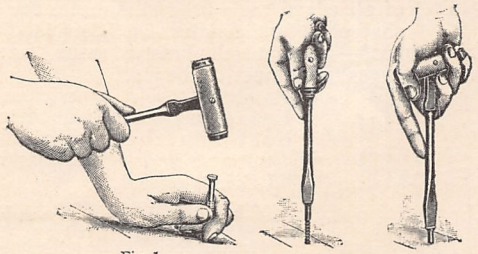

Fig. 1 Fig. 2 Fig. 3

CRESCENT HAMR-HANDL SCREW DRIVER

YOU start the screw by using the handle as a hammer (Fig. 1). Then use as an ordinary screw driver (Fig. 2). When the screw is nearly set and difficult to turn, spring the handle into position and finish easily (Fig. 3).

MADE IN THREE SIZES—

Style	Length of Blade	Width of Point	Price
K-24	4 inch	5/16 inch	$0.65 each
K-25	5 inch	3/8 inch	.70 each
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At your Dealers or sent prepaid upon receipt of price.

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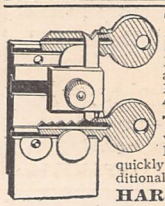

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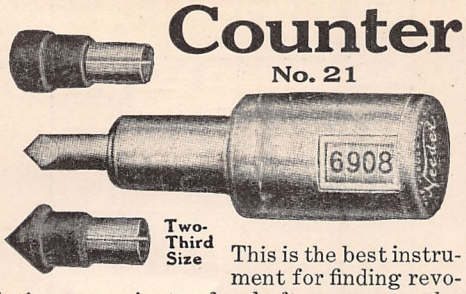
No. 21



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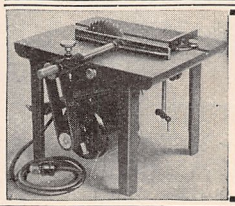

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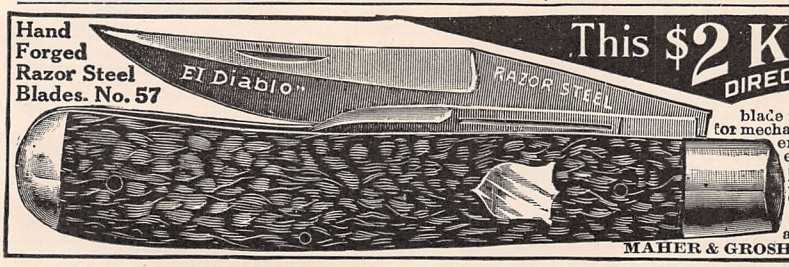

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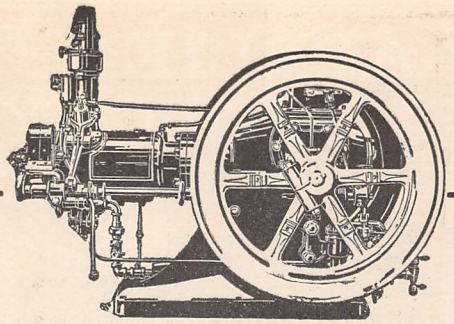

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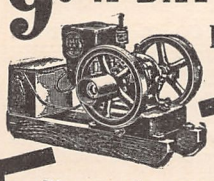

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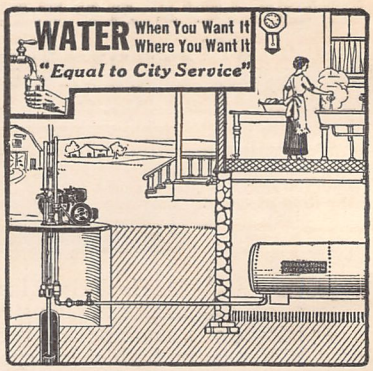

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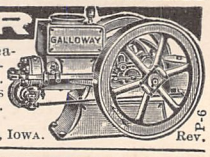

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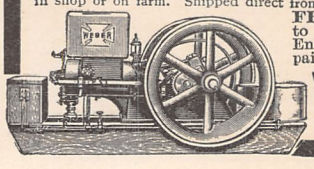

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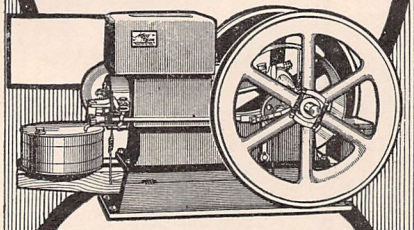

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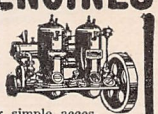

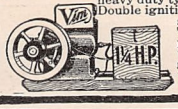

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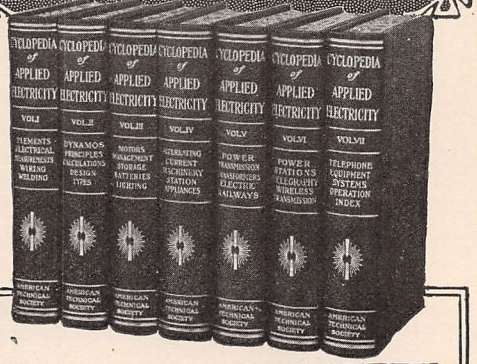

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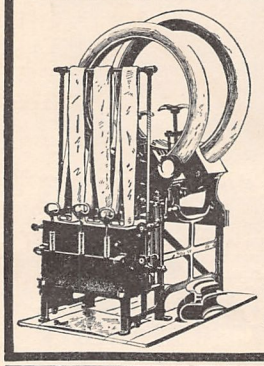

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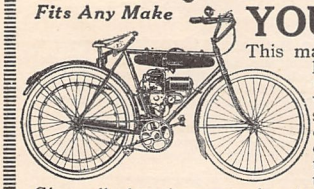

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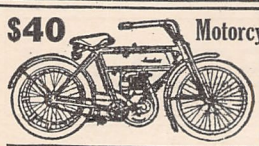

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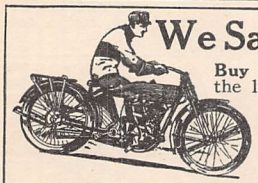

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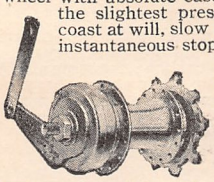

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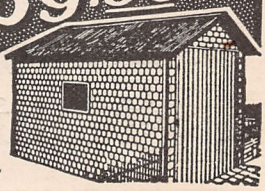

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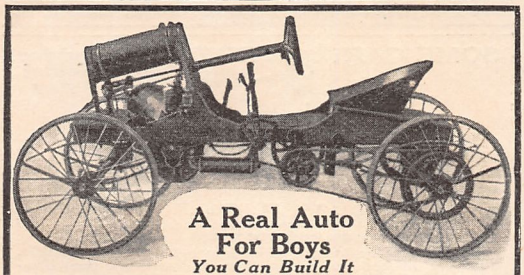
We specialize in 'em. Don't handle anything else. Nothing but the best, at rock bottom prices. If you want a guaranteed second-hand machine that will give the service that you have every right to expect, write for our big, descriptive list. Reference, State Street Trust Co., Boston.
George N. Holden, *Indian Motorcycle Agent*
186 Massachusetts Ave. BOSTON, MASS.



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You Can Build It

Send a quarter for drawing, description, instructions and price list of parts. They make it easy.
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Fits Any Standard Motorcycle

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You can go to work on your motorcycle—and in the evening hitch on your Rear Car and take two adults and a child for a joy ride.

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Cygnet Rear Cars can not tip over or skid.

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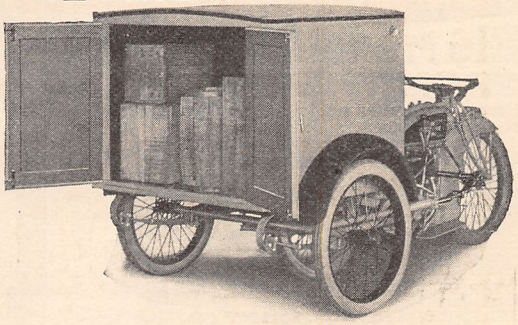

On Time Without Fail!

When he rides to work on

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TRADE MARK

No more fooling with cheap tires, for men who have tried Vitalics. *It simply doesn't pay.* A little more invested in Vitalics, prevents embarrassing delays *and saves money besides*, for they last *more than twice as long* as ordinary tires.

The reason is simple: Only the finest quality white rubber goes into Vitalic tires, while in even the *best* of other tires, cheaper grades of rubber are used. The difference is instantly felt in the soft, flexible Vitalic tread, which *holds its life* long after other tires have dried out. Then, under the Vitalic tread there are two layers of genuine *motorcycle fabric*—not just ordinary bicycle fabric put in other tires.

A tire like that costs a little more, and men with an eye to economy gladly pay the difference because they know *it saves both money and time.*

Write for folder, "From Boston to San Francisco on One Set of Tires"—told by the man who rode the bicycle.

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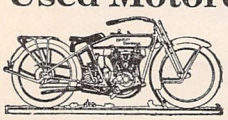

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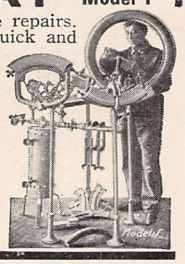

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Motorcycles are built for the red blooded, outdoor man who appreciates the throb of a powerful motor; the unhesitating sweep up and over the worst sort of hills; the unfailing, faithful drive that sends the Emblem without faltering through sandy and treacherous roads.

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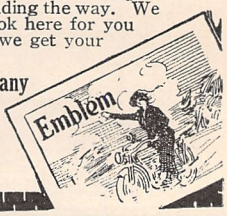

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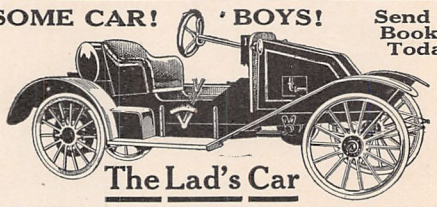

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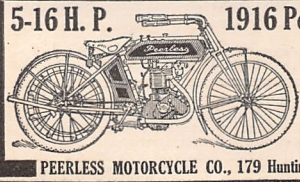

with Free Engine, Bosch Magneto, together with the best there is in Motorcycle construction, Power, Speed, Silence, Endurance, and those wearing qualities so essential for low cost of maintenance.

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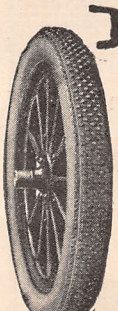

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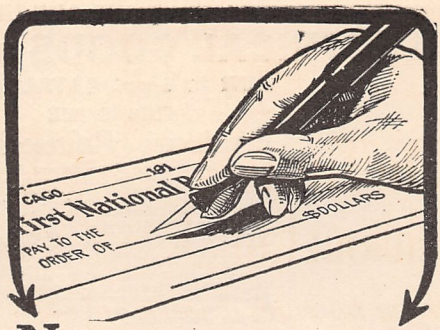

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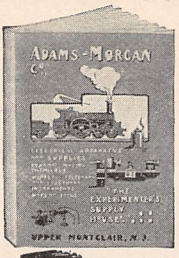

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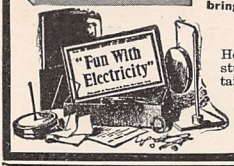

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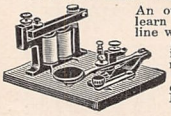

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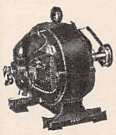

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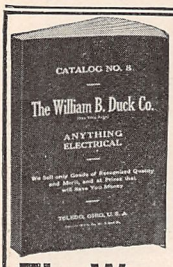

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$2000 Loan in Improvements. We will lend you up to $2000 in improvements in certain districts with no security other than the land itself. Particulars on request. Twenty years for repayment of loan with interest at 6%.

Ready-Made Farms for Sale. Farms which we have developed by providing house, barn, well and fencing and in some cases cultivation for sale. Special easy terms.

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We Want You, We Can Afford to Help You. We own the land. We want the land cultivated. Our interests are mutual. Buy direct and get your farm home from the Canadian Pacific Railway. Send for free book.

J. S. DENNIS, Assistant to the President

Canadian Pacific Ry.

39 Ninth Avenue

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2000 ohm complete double set $4.00
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We guarantee that these 'phones are real wireless receivers of standard double pole construction, wound with genuine copper wire, and fitted with best quality headband and cord.

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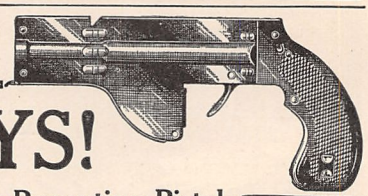

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SHOOTS a hole in a paper tape—fifteen hundred loud reports from one charge. Made of blued gun-metal—8 inches long—easy action—absolutely harmless—no powder or projectile—permitted in any community.

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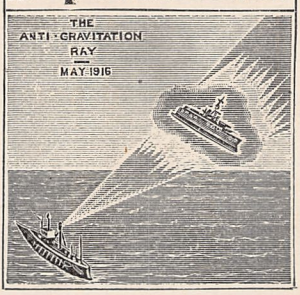

THE big electrical Magazine for those who dabble in electricity and Wireless. The "How-to-Make-It" magazine, chuck full of experiments and the latest electrical progress. Foremost authority on WIRELESS in the United States. Official organ of the **Radio League of America.** Over 200 wonderful illustrations with over 100 articles in each number. You are not keeping abreast with the times unless you read the **Electrical Experimenter.** One copy will convince you. Every issue also contains the snappiest and most up-to-date scientific stories that will delight you.

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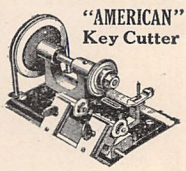

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Make Canoeing the Real Summer Sport

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Burns Kerosene. Can't explode. Can't set fire to anything. Burns in all kinds of weather. Rain proof, wind proof, bug proof. For farmers, teamsters, hucksters, plumbers, dairymen, campers—everybody needs it.

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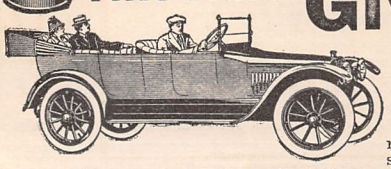

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Make Your Own Motorboat—It's Easy

You can equip it with a complete power plant, Bosch high-tension magneto, full-float feed carburetor, noiseless muffler, weed-proof propeller, rudder and tiller at small expense. Simply clamp the Ferro on your rowboat. Speedy, reliable, easy to operate. Selling Ferro Motors is pleasant, profitable work. You only need buy one motor for demonstration. Some fine territory open for the first-comers. Ask for agency proposition No. 215.

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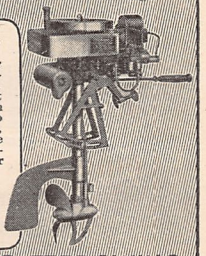

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Genuine Blue White Perfect Cut Diamond of fiery brilliancy in 14k. solid gold Tiffany style solitaire ring. Guaranteed $50 retail value. Our import money-saving price, **$26.88**

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Same ring as shown above, complete with
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Men's 14k. 'Ideal' tooth solitaire, complete with
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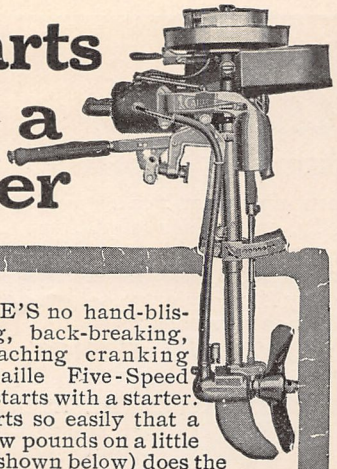

THERE'S no hand-blistering, back-breaking, arm-aching cranking with a Caille Five-Speed Motor. It starts with a starter. And it starts so easily that a pull of a few pounds on a little handle (as shown below) does the trick. The starting mechanism is fully enclosed in a drum and mounted on top of the flywheel. It is positive in action and mechanically perfect. The

CAILLE DETROIT 5 Speed Motor

can be instantly attached to any rowboat and gives you five speeds—a high speed (7 to 10 miles per hour) to hurry you to the fishing or hunting grounds—an ideal trolling speed—a neutral—a slow and fast reverse. And, mind you, all speed changes are made without stopping, reversing or altering the speed of the motor. It always runs at normal speed. When set at neutral, the boat stands still while the motor remains running.

Other Caille Features

include water cooled silencer on exhaust; magneto in flywheel; self-lubrication; speed propeller; water-tight gear housing; cushioned steering handle. You'll receive full details when you ***send for Catalog No. 10.***

Dealers Wanted

We also build marine motors from 2 to 30 h.p. Details in special catalog No. 24. When writing please give dimensions, style and purpose of boat to be powered.

The Caille Perfection Motor Co.
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Everyone, boy or man who spends much time in the open should have a copy of the new FREE Camp Guide, which gives EXACTLY the information that is most necessary for campers, hunters, trappers, fishermen, Boy Scouts, etc. Get a copy, and profit by the experience of others who have many times gone through the things you contemplate.

7 x 7 foot Wall Tent $5.50

Serviceable, water, storm, and wind-proof. Perfectly suited for camping trips of all kinds. Made of 8-oz. single-filling duck of first quality. Made with a fly. Easy to erect, carry, or take down. Made in more than 25 sizes, at low prices.

Scout Tent No. 1, $2.50

Similar to tents used by U. S. soldiers on active duty. Excellent for troops of Boy Scouts, fishermen, hunters, trappers. etc. Easy to carry, take down, or erect. Also called Shelter Tents. Wind, weather and storm proof. Fine for Boy Scouts to carry on hikes. 5 feet 3 inches, by 4 feet 6 inches wide, by 3 feet 9 inches high.

No. 1, Special white cloth	**$2.50**
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Send for Tackle Catalogue with ***color sheet,*** **Logansport, Ind.**
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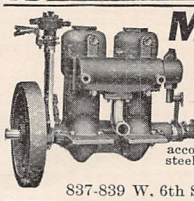

is what you get in Watkins Class "B" all iron motors. Especially fine for canoes and light boats. Constant and efficient.

3 H. P. single cylinder	45 lbs.
6 H. P. double cylinder	85 lbs.
12 H. P. four cylinder	155 lbs.

Are light, at the same time strong, accomplished by using semi-steel castings, high carbon steel shaft, bronze bearings, high class workmanship.

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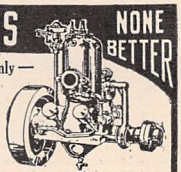
Toledo MARINE MOTORS

NONE BETTER



Special Cash Prices for this month only—

3 H. P.	**1 cyl. complete**	**$ 55.00**
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Fully guaranteed by a responsible concern. 2 cycle, 2 port, 3½x3½ and 4½x4½. **Send for free catalog "C."**

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And you'll be proud of it because of its beauty, grace, speed, efficiency and safety. Designed by America's foremost naval architects and built in the world's largest boat factory. Mullins steel boats can't sink, leak or waterlog—never need calking. Two and four-cycle engines—silent, under-water exhaust. 60,000 in use. 1916 models ready for delivery.

Handsome, interesting catalog on request. Write today.

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World's largest manufacturers of steel and wooden pleasure boats

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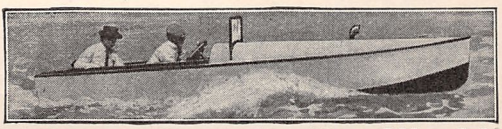

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$45 Complete k. d. boat as described.

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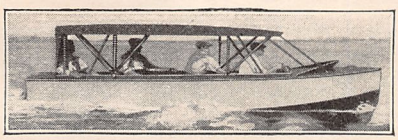

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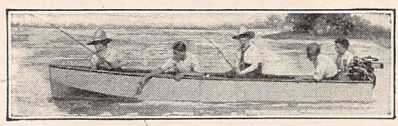

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Complete k. d. boat **$25**

Finished ready for motor **$45**

With inboard or outboard motor installed **$89**

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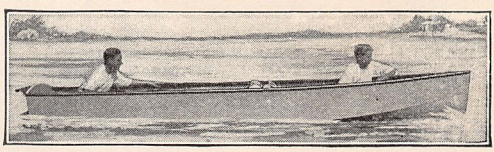


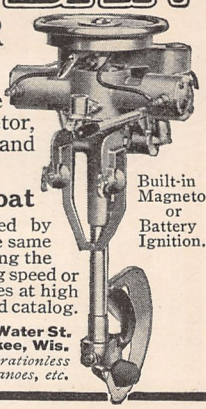
Norman Durant, 6 years old, owns and runs a Koban.

Unmatched Speed

NO VIBRATION

Absolutely dependable—Easy to start—Easy to manage —Without question the Finest Rowboat Motor Made.

The Great 2-Cylinder KOBAN ROWBOAT MOTOR



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Vibration is entirely eliminated by opposed cylinders that fire at the same time. Reverses by simply pressing the button. Runs perfectly at trolling speed or can skin nine out of ten launches at high speed. Send for 24 page illustrated catalog.

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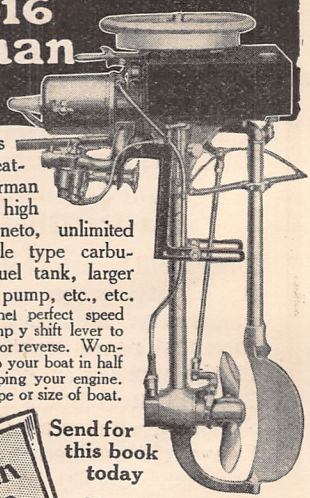
Our line also includes a 2 cylinder vibrationless inboard motor for small launches, canoes, etc.

10 NEW FEATURES *in the* 1916 Waterman Porto



Our new catalog describes in detail all the latest features of the 1916 Waterman Porto, including built-in high tension fly-wheel, magneto, unlimited speed control, automobile type carburetor, double capacity fuel tank, larger bearings, newly designed pump, etc., etc. The Waterman Porto has the perfect speed control of an automobile. Simply shift lever to get any speed desired, forward or reverse. Wonderful flexibility. You can stop your boat in half its length — dock without stopping your engine. Troll at any speed with any type or size of boat.

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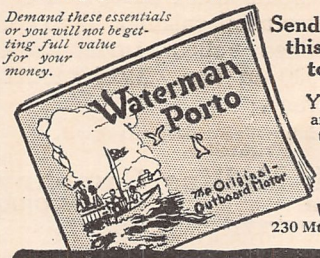
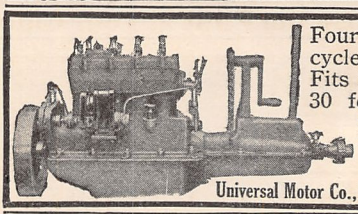


Send for this book today

You will find it full of valuable and interesting information about the new features of this original outboard motor, and it also tells the story of the first outboard motor ever built.

Waterman Motor Company
230 Mt. Elliott Ave., Detroit, Mich.



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This new booklet is of vital interest to you. Tells all about our paddling, sailing, motor and sponson models; tells you just what a canoe should be for a given purpose.

Kennebec models are the result of years of experience in canoe building, and an intimate knowledge of canoeing. The materials used are the best that can be obtained.

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Ask for any (or all) of them if you are interested in boating for pleasure, or profit. Book 1 shows more boats than motor show.

Gray Motor Company
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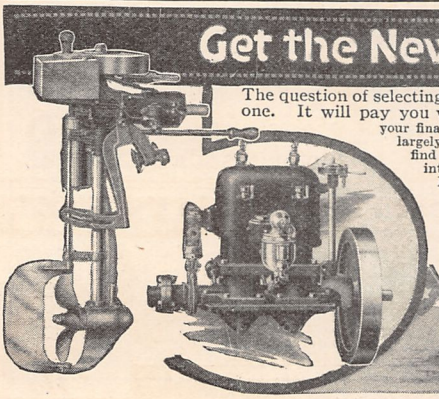
GRAY Motor Co.

Get the Newest *LA* Engine Book

AN *LA* ENGINE FOR EVERY PURSE AND PURPOSE



The question of selecting the right engine for that boat of yours is an important one. It will pay you well to get all the information possible before making your final decison, as the satisfaction you get from your outfit will depend largely upon the care you take in choosing your motor. You will find the new L-A engine book brim full of valuable hints and interesting engine information. It describes the complete line of L-A inboard and outboard motors for canoes, rowboats, pleasure boats, work boats, etc., and gives complete details of our liberal

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whereby you can have the privilege of proving out the quality of L-A Motors before making your final decison. Write for YOUR copy to-day. **Lockwood-Ash Motor Co.**
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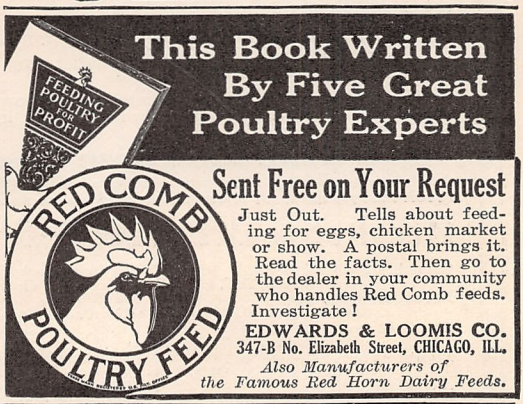

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A big manufacturer wants "a dish-washing device that will wash any style or size of dish with one handling."

Another company has asked me for a patented perfume vending machine—one that will enable milady to drop a penny or nickel in the slot and have her handkerchief perfumed.

A man with money to invest writes that he wants an improvement in "an automatic lighter to take the place of matches" and the same man is looking for "a small vacuum cleaner for clothes, that is, one that will do the same work as a common brush broom, except that it would take out all the dirt in the cloth besides brushing it."

A big steel and iron company wants "patents on a first-class cow stanchion, litter carrier or feed grinder."

Results Speak Loudest—But Here Are Some References

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National Rack Co., 61 Hannover St., Boston, Mass.
The C. J. Loftus Co., 13 Spring Common, Youngstown, Ohio
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A LARGE NUMBER OF OTHERS IN MY BOOKLETS.

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World-Wide Call for New Inventions

By a WASHINGTON PATENT ATTORNEY

War Closes Factories in Europe—America Becomes World Market—Golden Opportunity for Inventors

Europe's factories are closing. The war has taken its toll of industries as well as of men, and with hundreds of foreign factories idle, America has become the market-place of the entire world. The highest daily exports from America were reached during the past few months and this may be taken as a significant indication of what American manufacturers will be called upon to supply when the conflict is over.

Hundreds of manufacturing concerns realize this, and are on the look-out for articles patented here, which will give them the exclusive right to manufacture and ship abroad. It is up to the American inventor to supply the demand.

Not only are articles wanted for export, but for home consumption as well. There is a demand for devices in almost all lines. Many inventors have already heeded the call and have made good. There is equal opportunity for others.

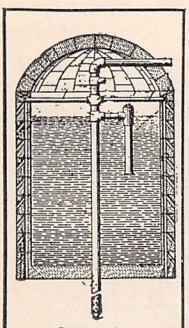
The rubber-faced metal clip to go on the end of the curtain-shade stick to prevent noise when it blows against the window frame is having wonderful success and shows what may be done with even a simple article. Another simple thing is the Sure-Grip Towel Holder that the inventor is selling with wonderful returns. The Concrete Cesspool illustrated has brought the inventor more than $50,000 in the sale of state and county rights in addition to royalties.

A big business built on a small invention of Towel Holder.

THE BIG DEMAND

The demand for good patents seems to be bigger at present than ever before. The firm of attorneys of which the writer is a member is constantly receiving requests from manufacturers for inventions in all lines. For instance, a New York Specialty Co. wants a dish washer, odorless garbage can and mail order articles, while a man from Illinois asks for anything that can be manufactured in a wood-working factory. A Lockport concern wants patents on articles for household and office use, while a Newark concern writes: "What have you in a peanut vending machine that can be bought from the owner?" A Chicago man says: "I wish you would put my name on your list and keep it there. I wish to buy a patent or operate on a royalty."

We have more than forty requests for patents on dish washers and drainers, sixteen requests for devices for turning sheet music, twenty-eight for attachments for automobiles, twenty-four for vacuum cleaners, and many others for advertising novelties, ash receptacles, clothes pressing devices, envelope fasteners, fly traps, fruit pickers, games, mail boxes, toys, vegetable slicers, water filters, window cleaners, window screens, and other things.



Concrete Cesspool pays the inventor $50,000.

There are hundreds of other requests. Some mention particular inventions; others want any good patented article. This proves the wonderful present demand.

Our firm has compiled a booklet entitled, "What to Invent," giving a list of many inventions about which inquiries have been made. We are always glad to mail it free to anyone, together with "How to Obtain a Patent," another book which explains how to protect inventions. We also give opinions regarding the patentability of inventions, without charge. Any reader of this article is at liberty to send us a sketch and description or model of any invention that he may have, when we will at once render an opinion concerning its patentability. To those who become our clients, we supply the names and addresses of the above mentioned manufacturers, without cost.

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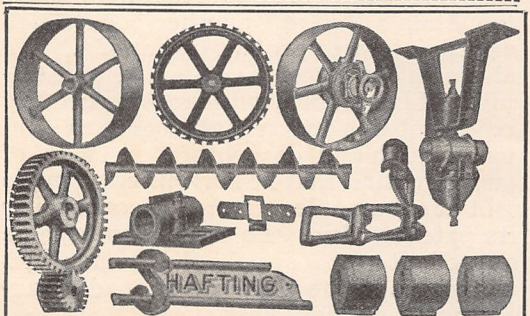

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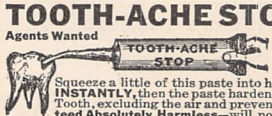

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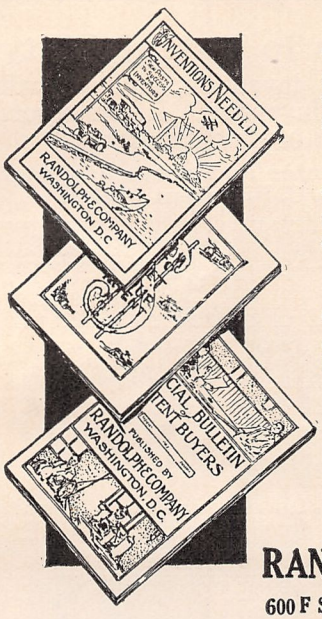

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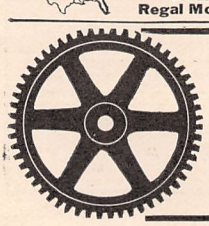

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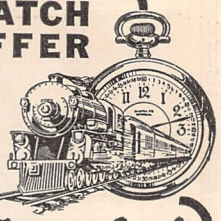

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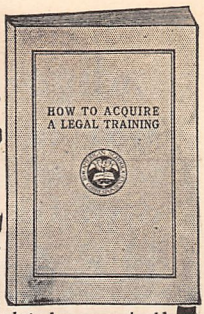

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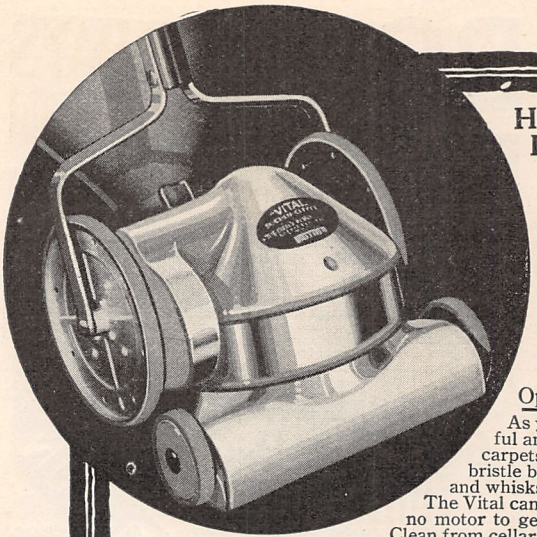

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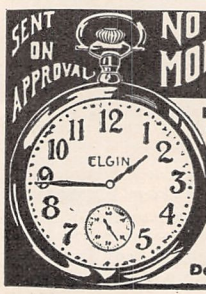

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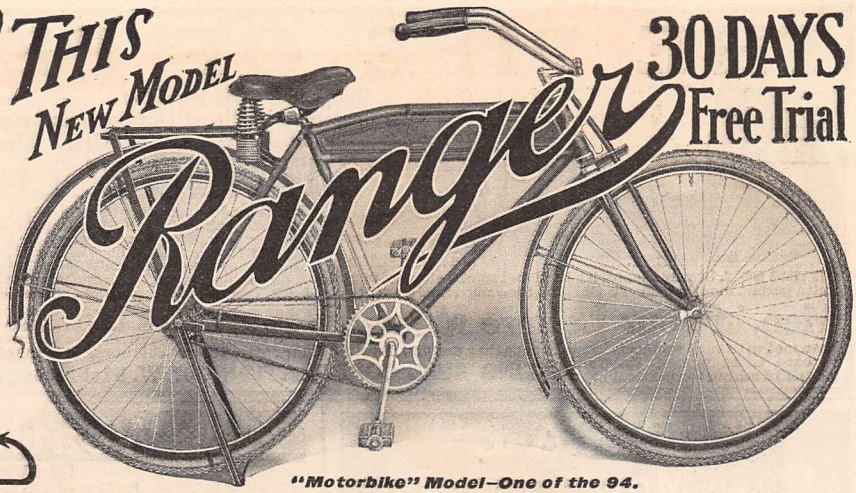

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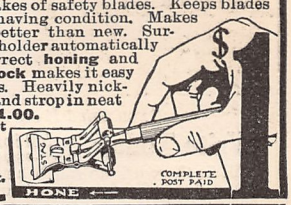

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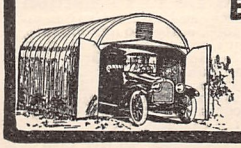

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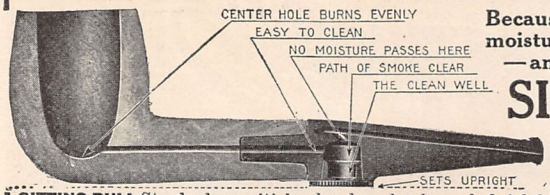

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It can't spill. The hot bowl itself does not rest upon anything. Mouth moisture can't get by the well and foul the bowl and smoke channel, which means **A CLEAN, DRY AND FRAGRANT SMOKE.** Moistened tobacco means immediate deterioration that changes its rich flavor. SITTING BULL will give you the richest smoke you have ever enjoyed. Don't blame the innocent tobacco any more.

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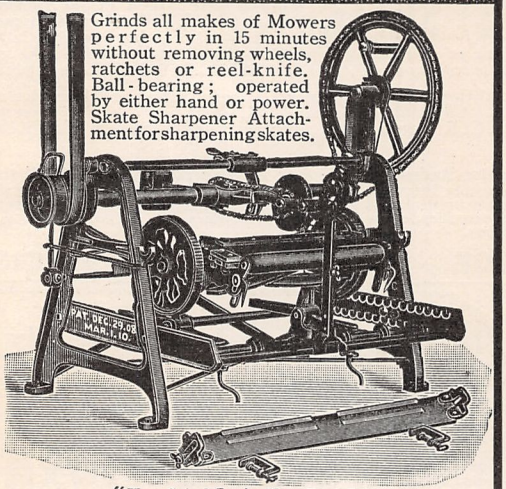

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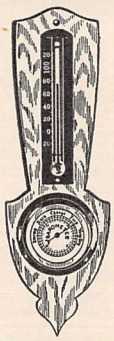

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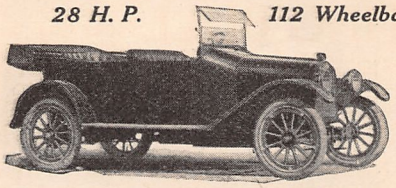

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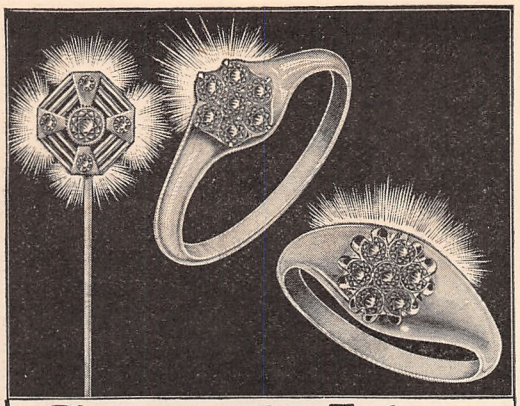

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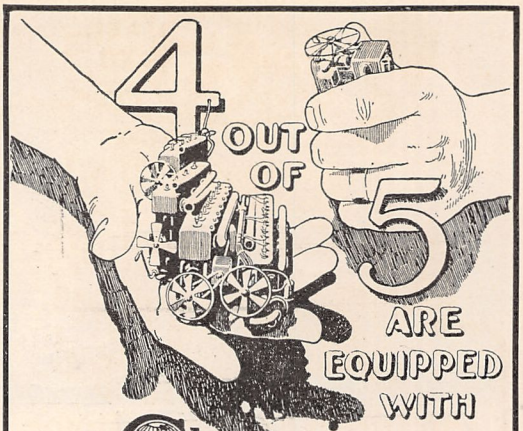

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HERE is the official estimate of the Automobile Chamber of Commerce on automobile production this year.

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Of these, over a million will be Fords, Overlands, Studebakers and Maxwells, equipped with Champion Dependable Spark Plugs.

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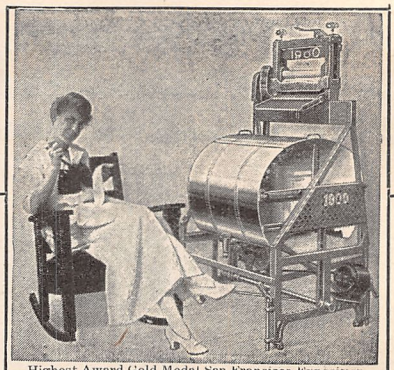

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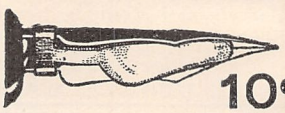

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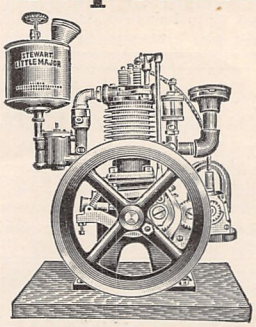

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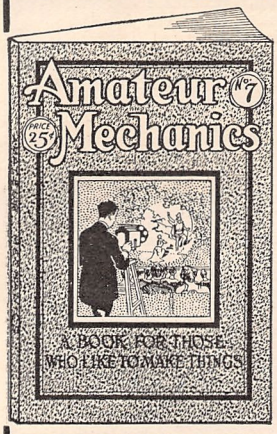

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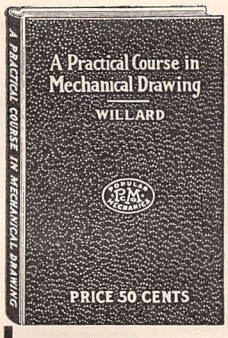

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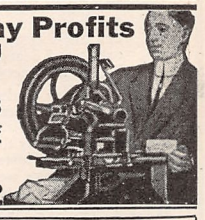

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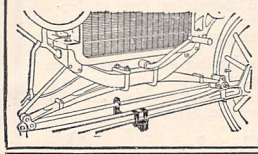

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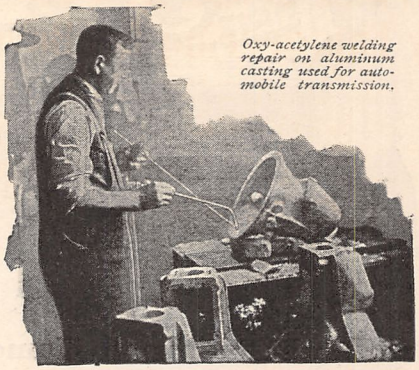

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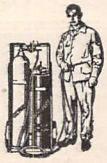

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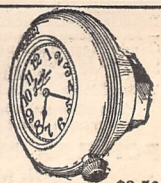

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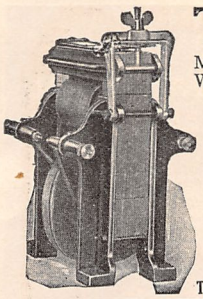

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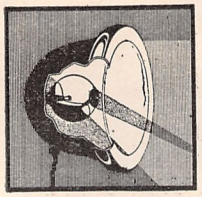

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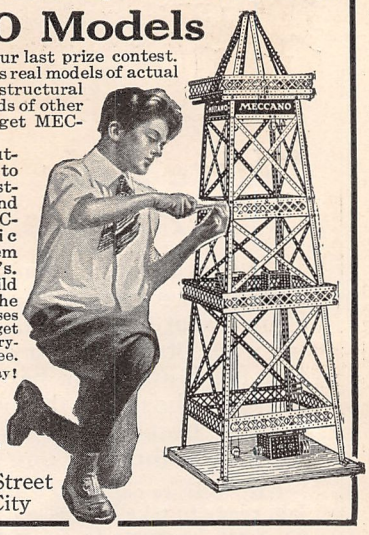

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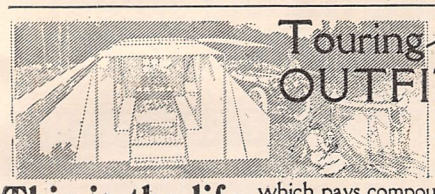

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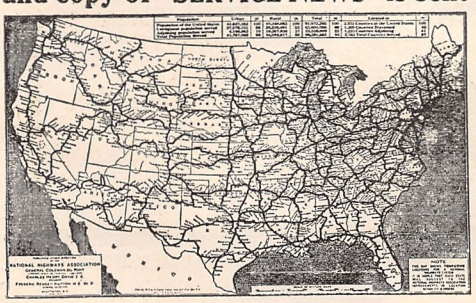

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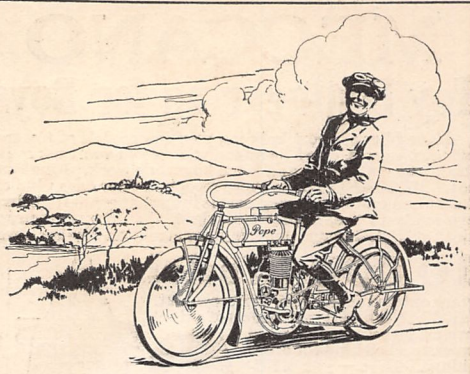

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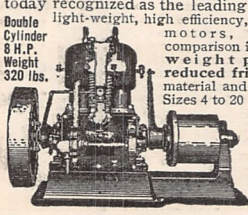

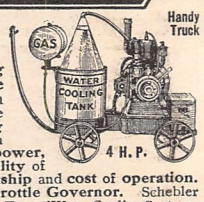

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PURE WOOD FIBRE

Earthquakes or explosions won't crack or shake down Beaver Board walls and ceilings.

When they're up, they're up to stay.

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In new homes Beaver Board takes the place of lath, plaster and wallpaper and provides not only more attractive walls and ceilings but more substantial as well.

Our free Design and Decoration Service will help you plan.

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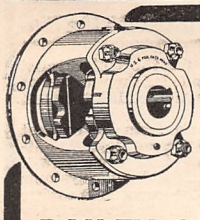

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Thousands in use—every one sold on a 30-day money-back offer. You'd hardly know it was the same car—try it and see. See dealer, or write for circular.

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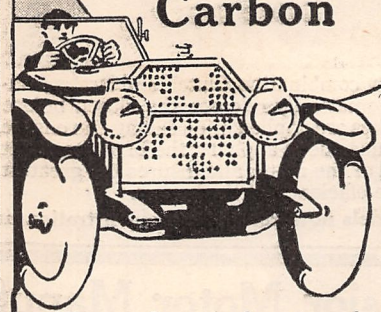

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We can show you how to make your car or truck give 25% to 50% more power—more speed—and more mileage from a less amount of gas and we can guarantee 100% less motor trouble resulting from carbon formation—all through a simple device that costs you only $5.00. Mail the coupon below—make us prove our claims.

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Enclosed find $5.00 in payment for one VAPO HUMIDIFIER, it being agreed that after 30 days' use if I am not entirely satisfied with same, you will refund the $5.00 on receipt of the instrument.

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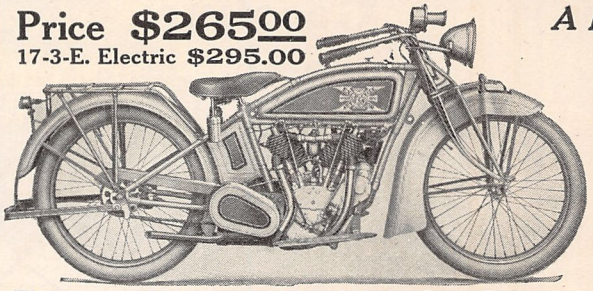
Price $265.00
17-3-E. Electric $295.00



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Every one of them fully developed to mechanical and practical perfection.

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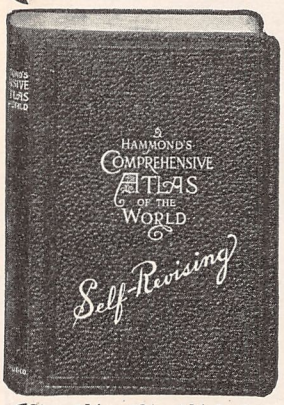

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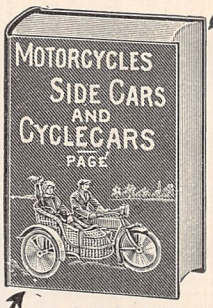

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Your earning power — are you steadily increasing it?
Is your memory retentive, or is it failing?
Why do some men and women succeed, while others fail?
Are your faculties of reasoning, your powers of analysis, sharp, clear and keen?

ARE YOU A LEADER OR A FOLLOWER?

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Do you feel health, strength and vim bounding through your veins?
Have you considered why some people are content with a menial position and poverty in their old age?
Now every thinking person knows that there must be a cause for all of this. Of course there is a cause, but what is it? I will tell you:

The Start

Success or failure depend upon—

(1) Your Mental Condition (2) Your Physical Condition
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The keenness of your intellect, your ability to analyze conditions, your powers of straight thinking, all depend upon the quickness of your brain to generate nerve power, while this in turn is dependent upon the richness of your blood, the sunniness of your disposition, the sureness of your concentration, the strength of your will and the reliability of your memory. It is the harmonious development and co-ordination of all these that insure success.

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The Nicholson-Wase Course Gives You Virility of Speech—Power to Combat Difficulties as They Arise—Sureness in Business—Strength of Purpose—Power of Observation and Analysis—Retentive Memory—Power of Facial Expression—Graceful Carriage—Strong Nerves and a Balanced System.

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There is no complicated system, there are no unpleasant or difficult rules to follow. The Nicholson-Wase Course has no relation to sex, but is equally efficient for men and women.

Fill in this coupon and mail it to me today. In a short while you will thank me for the offer I will make you.

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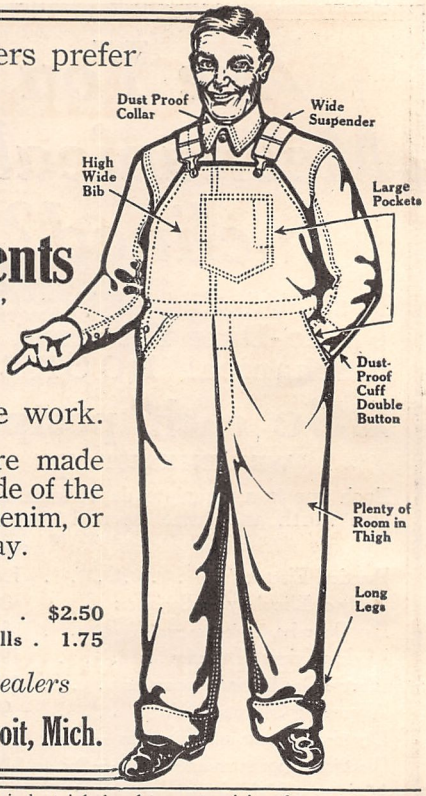

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OUR UP-TO-DATE
Pen and Pencil Clasp
with complete yearly calendar. Buy from your dealer or send 15c for sample and particulars

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Another industrial development arising from the necessity of creating supplies stopped by the war is found in the special treatment of mica by an American company, says the Edison Monthly. This concern is extracting the mica in large amounts, and is cutting and stamping it in various kinds of pieces, such as washers, disks, etc., for use with magnetos, rheostats, and other electrical apparatus. Special work of a sort heretofore done in Germany has made it imperative for the company to double its working force.

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The first and only mantle lantern ever made that will give satisfaction in actual practical and continuous use.

200 Actual Candle-power as much light as forty kerosene lanterns, and will burn twelve hours on one quart of ordinary low grade gasoline.

ABSOLUTELY STORM PROOF simple in construction and operation, safer than kerosene lantern, will last a life time.

USED EVERYWHERE in the city and in the country, by automobilists, home-owners, farmers, summer-resorters, contractors, showmen, yachtsmen and thousands of others.

Agents Wanted to handle exclusive territory.

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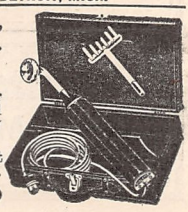

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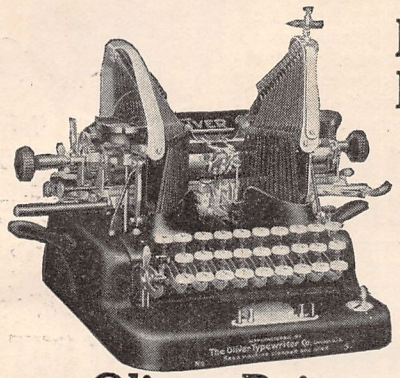
Oliver Typewriter



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This is the best typewriter offer ever made. The typewriter is the genuine model No. 5 Standard Visible Oliver with complete, brand-new equipment. Perfect machines only. Not shop worn, not damaged, not inferior. Back spacer and tabulator—no features lacking. Warranted to be the equal in quality of any other $100 typewriter.

This offer is not on some ancient style of blind typewriter, but on an up-to-date, standard, visible machine, the same kind of typewriter that many thousands of the world's best business firms are today using.

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Nearly one-half million Olivers have been sold. Its record has never been equaled. It is easily "The Favorite."

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If you do not find it to be the best typewriter that you ever examined, satisfactory in every respect, the best value offered anywhere, then you simply return it to the express agent, who will give you back the $4.80 and return the typewriter to us at our expense.

If you decide to keep it, the express agent will forward the $4.80 to us and it will be deducted from the $42.80 price, leaving a balance of $38.00, which you can pay at the rate of $2.00 per month, the first monthly payment not being due until one month after date of delivery.

There are no interest charges, no red tape, no salesmen, no collectors, no bother. The simple coupon is all we require.

Send the coupon today. Make sure of getting this bargain, as we will only supply 100 typewriters at this price.

United States Typewriter Exchange
Dept. 351, All Light Bldg., CHICAGO, ILL.

Trial Order Coupon

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You may send me a No. 5 Oliver Typewriter on approval. When it arrives I will leave with the express agent $4.80 with the understanding that if I do not wish to keep the typewriter the $4.80 will be returned to me by the express agent when I return the typewriter to him within ten days from the date I receive it.

Otherwise I will keep the typewriter and the $4.80 will be forwarded to you to apply on your special purchase price of $42.80, and I will pay the balance of $38.00 in 19 consecutive monthly installments of $2.00 each, commencing one month from date of delivery.

The title of the Oliver Typewriter remaining in you until it is totally paid for.

Name.....

Address.....

References.....

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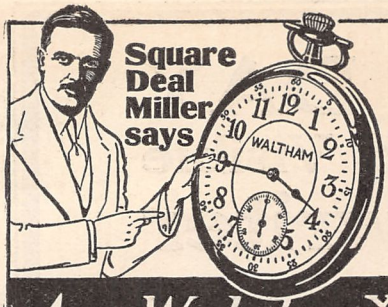

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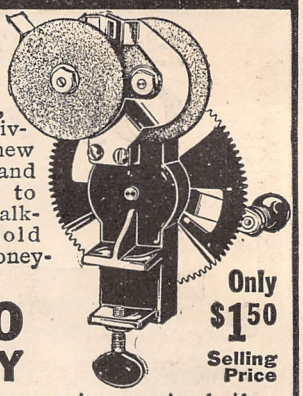

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Sharpens any kitchen, paring, carving knife, or shears in 10 seconds. A child can use it. No competition. Low priced. Leave fifty on trial—*fifty orders at 200% cash profit.*

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Abolishes dull knives and shears forever from every home. No charge for territory. Business furnishes capital. *Profits start first day.* No experience required. No delay. *Send no money.* Just write for complete particulars—*FREE.* Ray Carter, of Mass., sold 36 in 2 hours—*profit $36.* Forest Webb, of Pa., sold 12 in 3 hours—*profit $12.* Act at once. Write *Now.* Send name and address, and give name of your county.

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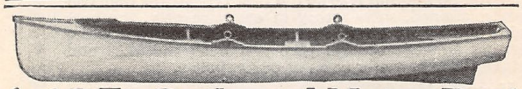

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Investigations as to the source of occasional interruptions in the operation of electrical-transmission lines in Japan have revealed that reptiles make a practice of climbing the towers to take sun baths on the cross arms, and, getting across the conductors, cause short circuits.

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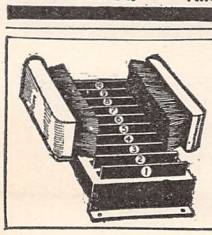

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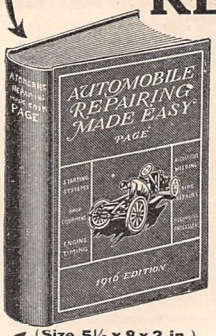

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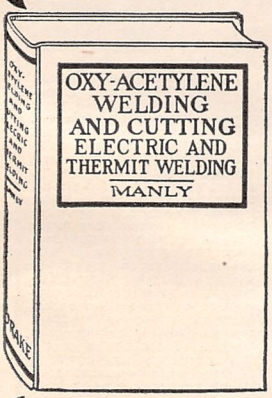

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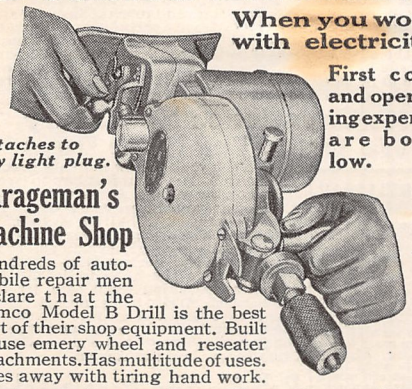

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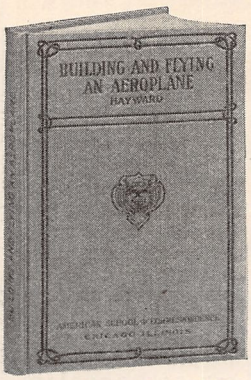

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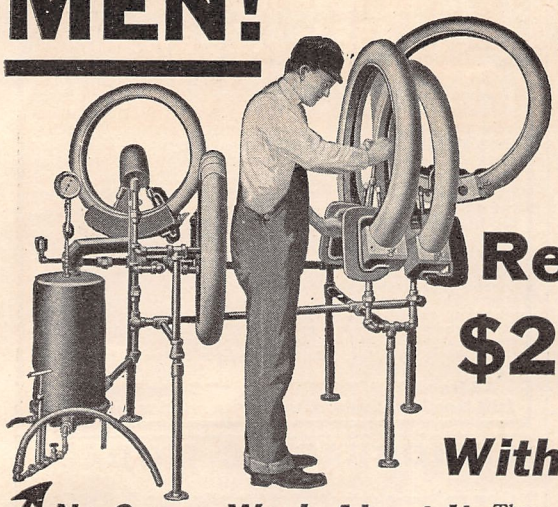

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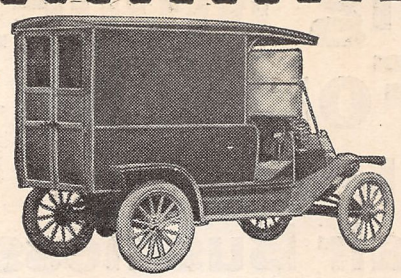

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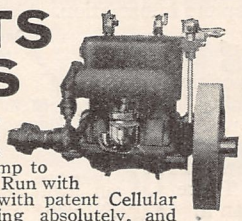

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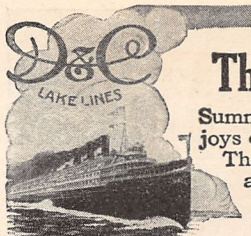

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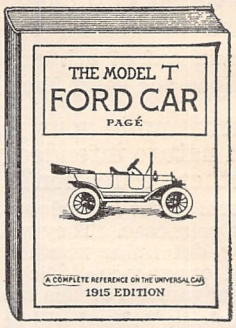

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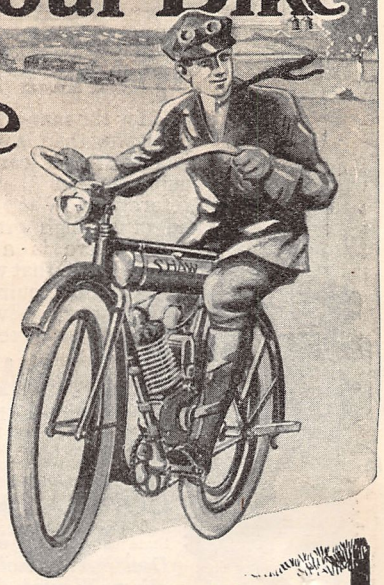

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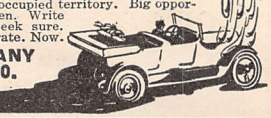

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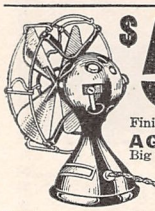

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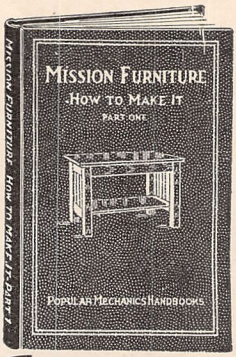

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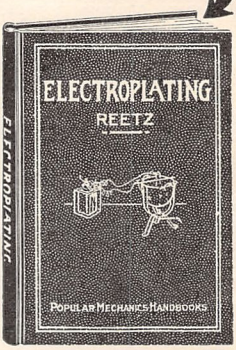

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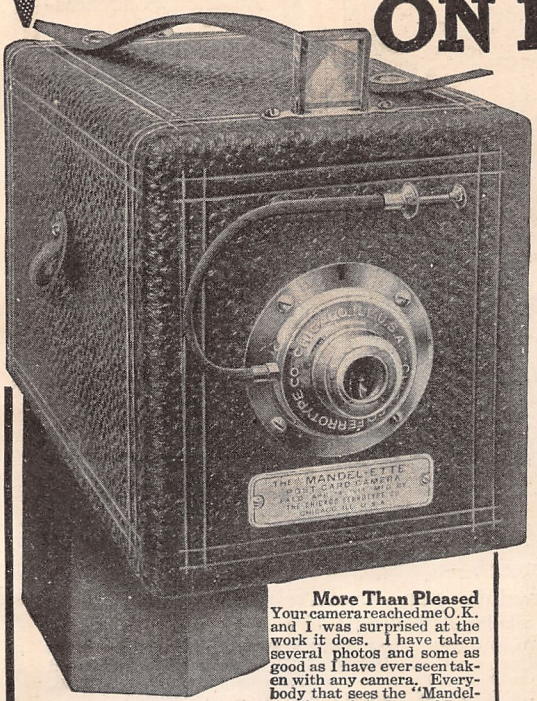

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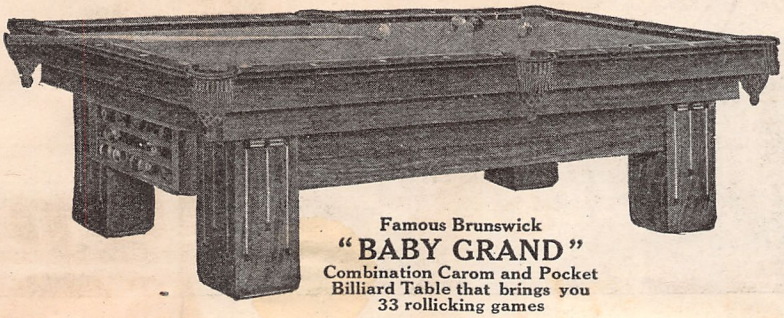

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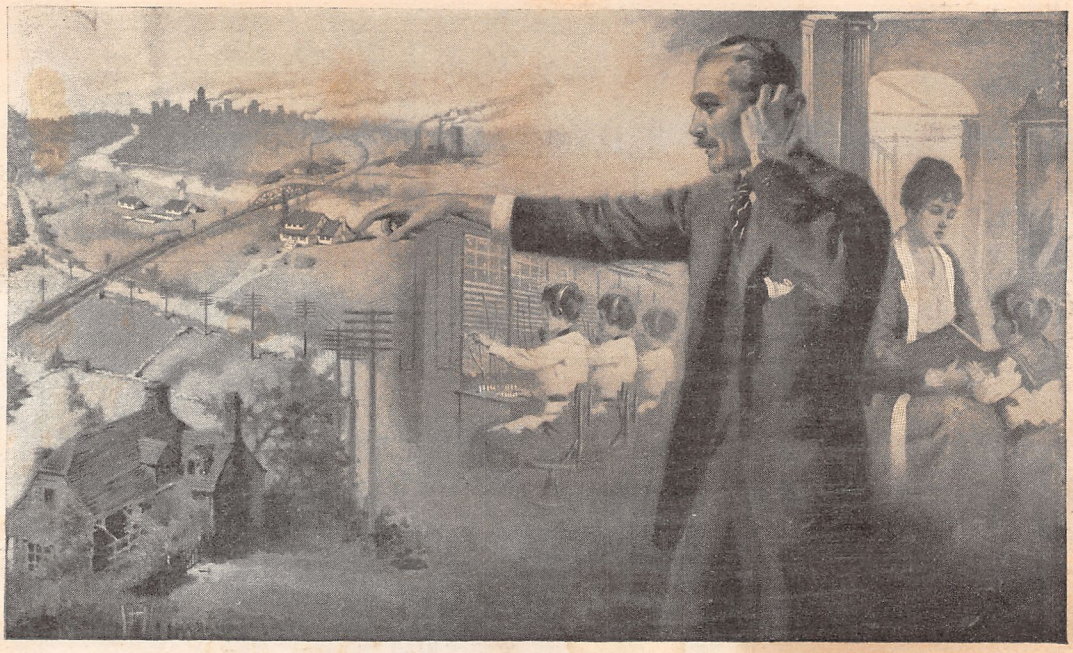

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In the Bell System you have the most complete mechanism in the world for communication. It is animated by the broadest spirit of service, and you dominate and control it in the double capacity of the caller and the called. The telephone cannot think and talk for you, but it carries your thought where you will. It is yours to use.

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One Policy *One System* *Universal Service*

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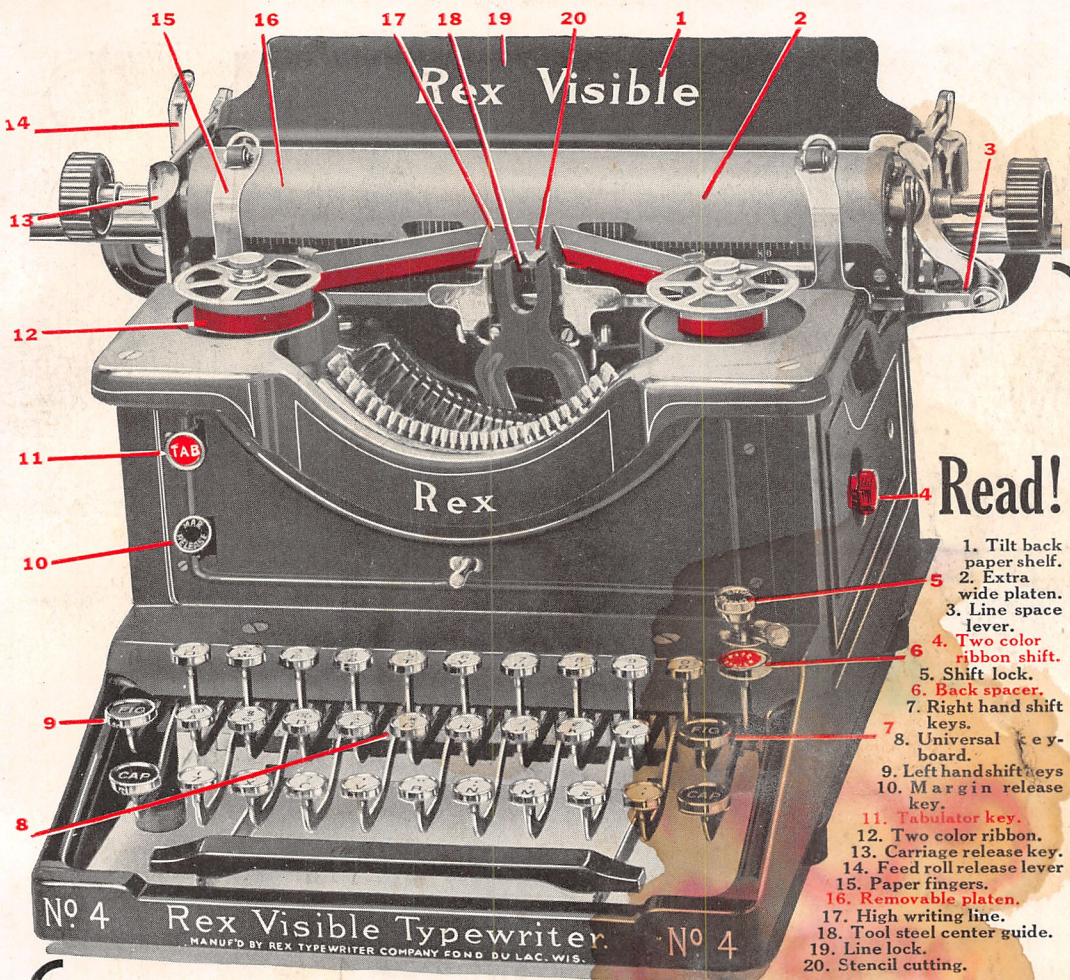

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